Quality Systems Manual
Materials Division

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Inventory and Calibration Information
All Labs

Test Records
< Each lab supervisor ensures that their equipment is calibrated at the specified intervals
< calibration record forms are kept in a filing system accessible to the Internal Quality System Reviewer.
< Any discrepancies in the system are referred to the Engineer for Materials for review and resolution.

Testing
< All lab test equipment is calibrated on a regular basis.
< The test records are maintained by each lab supervisor and stored in each lab office.
< New equipment is calibrated before first use.
< Equipment that is out of calibration is either repaired, or removed from service.
< Repaired equipment is calibrated before it is returned to service.

Tracking
Manual card filing system
< Information is stored in a card filing box with monthly divisions containing one card per piece of equipment. Each card indicates identification of the equipment and its calibration interval.
< The cards are placed in the month corresponding to the upcoming equipment calibration due date. After each time the equipment is calibrated, the corresponding equipment card is dated and placed in the monthly division of its next calibration due date .
< The equipment card file is manually checked on a regular basis to ensure all tests are done on time.

Automatic electronic filing system
< Information is stored electronically using a computer program that combines database functions with automated calendar tracking functions.
< The computer program stores data about each piece of equipment, its calibration, and its appropriate calibration interval.
< The computer program notifies the lab supervisor which equipment is due for calibration prior to the calibration date, and automatically resets for the next calibration date.

The spreadsheets on the following pages contain equipment and calibration information for each laboratory.

Aggregate Lab

Accreditation and Certification Information

Aggregate Laboratory

Equipment Item	Manufactuter	Model #	Serial #	UDOT #	Cal./Verif. Proc.Ref	Inter Month	Last Cal. Calibration	Next Calibration	Calibration Person	Date Rec'd	Date in Service	Condition when Rec'd
Lab Scale 1	Mettler - Toledo	SG 16001	2115509738 3		UDOT cp-sb	12	08/02	08/03	Shafer/Raleigh	1996	1996	New
Lab Scale 2	Mettler	PM 16	G01273	44-0925	UDOT cp-sb	12	08/02	08/03	Shafer/Raleigh	1987	1987	New
Lab Scale 3	Mettler - Toledo	SB 32001	1119230904		UDOT cp-sb	12	08/02	08/03	Shafer/Raleigh	2000	2000	New
Lab Oven 1	VWR	1675	900299		UDOT cp-do	4	02/03	04/03	Robert Tripp	1999	1999	New
Lab Oven 2	VWR	1675	1100202		UDOT cp-do	4	02/03	04/03	Robert Tripp	2003	2003	New
Lab Oven 3	VWR	1685	800102	44-1369	UDOT cp-do	4	02/03	04/03	Robert Tripp	2003	2003	New
Mech. Shaker	Rainhart	Mary Ann			UDOT cp-ms	12	09/02	09/03	Robert Tripp	2002	2002	New
Mech. Sample Splitter	Gilson	SP - 1		59-40-602						1970	1970	New
Mechanical Sand Equivalant	Soil Test	CL-232	144	59-44-087	AASHTO T-17	12	06/02	06/03	Robert Tripp	1970	1970	New
Sand Equivalant Test Set	Soil Test	CL-230			AASHTO T-17	12	06/02	06/03	Robert Tripp	1970	1970	New
Fine Void Content Apparatus Test Set	Gilson	SG - 40				12			Robert Tripp	2000	2000	Used
Coarse Void Content Apparatus Test Set	Gilson	SG - 42				12	N/A	N/A	Not in Service	2001	2001	Used
Sulfate Soundness Soak Tank	U.D.O.T.	Home made					N/A	N/A	Not in Service	1960	1960	New
Organic Impurities Test Set	Humboldt	HM-137								1990	1990	New
Conical Mold and Tamper	Humboldt	H-3360		C - 1 C - 2		12	07/02	07/03	Robert Tripp	1998	1998	New
Specific Gravity Bench and Tank	Gilson	SG - 20								2003	2003	New
Los Angeles Abrasion Mach.	Soil Test	H-501		59-44-78		24	05/01	05/03	Robert Tripp	1958	1958	New
Weight Measures 0.10				Agg.1	UDOT cp-uwe	12	05/02	05/03	Robert Tripp	1997	1997	New
0.10				Agg.2	UDOT cp-uwe	12	05/02	05/03	Robert Tripp	2002	2002	Used
0.25	Humboldt	H-3664.1		Agg.5	UDOT cp-uwe	12	05/02	05/03	Robert Tripp	2002	2002	Used
0.50	Humboldt	H-3661		Agg.3	UDOT cp-uwe	12	05/02	05/03	Robert Tripp	2002	2002	Used
0.50	Humboldt	H-3661		Agg.4	UDOT cp-uwe	12	05/02	05/03	Robert Tripp	2002	2002	Used
UA Pulverizer	VWR	24253-000		44-0945						1988	1988	New
Thermometer	VWR	8C799 2				12	12/02	12/03	Carter	1998	1998	New
Thermometer	ErTco	L 95 - 781				12	12/02	12/03	Carter	1998	1998	New
Thermometer	ErTco	5042				12	12/02	12/03	Carter	2001	2001	New
Thermometer	ErTco	G 96 - 182				12	12/02	12/03	Carter	2000	2000	New
Thermometer						12	12/02	12/03	Carter	2000	2000	New
Water Bath	Humboldt					N/A	N/A	N/A		2002	2002	Used
Sulfate Soundness Containers	UDOT	Home made								1997	1997	Used

Equipment Item	Manufactuter	UDOT #	Cal./Verif Proc.Ref	Inter Month	Last Cal. Calibration	Next Calibration	Calibration Person	Date Rec'd	Date in Service	Condition when Rec'd
12" SIEVES										
2 1/2	Endecotts	X000645	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
1 1/4	Endecotts	X100875	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
1	Tyler	X100945	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
1	Endecotts	X100861	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
1	Endecotts	X100860	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
3/4	Tyler	X001616	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
3/4	Endecotts	X100862	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
3/4	Endecotts	X100859	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
5/8	Tyler	X000884	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
1/2	Tyler	X000707A	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
1/2	Endecotts	X100864	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
1/2	Endecotts	X100857	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
3/8	Tyler	X000708A	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
3/8	Endecotts	X100864	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
3/8	Endecotts	X100857	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
5/16	Fisher	X001003Z	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
1/4	Tyler	X000690A	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
4	Tyler	X000601AG	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
4	Endecotts	X100865	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
4	Endecotts	X100856	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
5	Endecotts	X100949	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
8	Dual	X000638	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
8	Tyler	X002638A	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
8	Endecotts	X100866	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
8	Endecotts	X100855	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
12	Endecotts	X002926Z	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
12	Tyler	X000709A	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
16	Dual	X100180	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
16	Endecotts	X100854	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
16	Endecotts	X100867	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
30	Endecotts	X100868	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
30	Endecotts	X100853	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
40	Tyler	X0001660B	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
50	Tyler	X002794Z	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
50	Endecotts	X100852	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
50	Endecotts	X100869	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
100	Tyler	X0021137	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New
100	Endecotts	X100870	UDOT cp-sd	6	12/02	06/03	Shafer/Raleigh	1997	1997	New

Equipment Item	Manufactuter	UDOT #	Cal./Verif. Proc.Ref	Inter Month	Last Cal. Calibration	Next Calibration	Calibration Person	Date Rec'd	Date in Service	Condition when Rec'd
12" SIEVES										
100	Endecotts	X100851	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
200	Endecotts	X100874	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
200	Tyler	X002139A	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
200	Endecotts	X101051	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
200	Endecotts	X100871	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
200	Tyler	X002120	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
8" SIEVES										
2 1/2	Tyler	X000678	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
2	Tyler	X100923	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
1 1/2	Tyler	X00686	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
1 1/4	Tyler	X000679	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
1	Endecotts	X002431A	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
3/4	Sargent-Welch	X000648	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
3/4	Tyler	X000711A	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
5/8	Testlab	X100924	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
5/8	Testlab	X000676A	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
1/2	Tyler	X101322	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
1/2	Endecotts	X002425	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
3/8	Endecotts	X101156	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
5/16	Endecotts	X100873	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
5/16	Tyler	X000675A	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
1/4	Tyler	X101321	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
1/4	VWR	X100872	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
4	Dual	X000629	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
4	Tyler	X000604	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
5	Tyler	X000674	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
8	Gilson	X100199	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
10	Tyler	X101282	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
16	Fisher	X002169	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
20	Tyler	X000713	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
30	Endecotts	X101155	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
40	Tyler	X000715	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
50	Endecotts	X101237	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
50	Endecotts	X101236	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
70	Tyler	X100926	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
80	Tyler	X000626	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
100	Tyler	X000717	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
100	Tyler	X101159	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New
200	Dual	X002198	UDOT cp-sd	6	12/02	12/02	Shafer/Raleigh	1997	1997	New

Asphalt Labs

Asphalt Laboratory
Date: 01/14/2003

Equipment	Date Rec'd	Date in Service	Manufacturer	Model Number	Serial Number	Condition received
Rolling-Thin Film Oven	7/83	7/83	Cox and Sons	CS-325-A	44-717	new
Rolling-Thin Film Oven	10/93	10/93	Cox and Sons	CS-325-A	44-1177	used
Rolling-Thin Film Oven	6/2000	2/2001	Cox and Sons	CS-325-B	44-1335	new
Laboratory Oven	12/21/99	12/14/99	VWR	1350GM	1100302	new
Laboratory Oven	10/91	10/91	Lab Line	Imperial V 3486	44-1168	new
Laboratory Oven	2/93	2/93	Lab Line	Imperial V 3495	0293-0417	new
Viscometer Bath	3/95	3/95	Cannon	CT-1000	44-1203	new
Viscometer Bath	2-01	2-01	Cannon	CT-1000	44-1164	used
Saybolt Viscometer Bath	8/92	8/02	Precision Scientific	74966	44-573	used
Saybolt Viscometer Bath	1/2001	6-2001	Koehler	K21410	R90190065	new
Vacuum Regulator	2/95	2/95	Cannon	NA	44-890	new
Rotational Viscometer	1/93	1/93	Brookfield	RV-DV-11+	DE25287	new
Dynamic Shear Rheometer	1/95	1/95	B ohlin	DSR 11	95/3520/BOH/01a/008	new
Dynamic Shear Rheometer	Sept 98	Sept 98	Bohlin	CVO 50	98006670curc112	new
Bending Beam Rheometer	Feb 2002	March02	Cannon	TE-BBR	3294-A502	new
Bending Beam Rheometer	Apr 98	Apr 98	Cannon	TEBBR	3127-C	new
Pressure Aging Mechanism	July 99	July 99	Prentex	9300	93154	new
Direct Tension Machine	9/1999	9/1999	Instron Asphalt Pro	5525	5525-C9827	new
Direct Tension Machine	1-97	1-97	Instron BTI 3	55BT1	C6646	new
Cleveland Open-Cup	7/90	7/90	Humboldt	gas	44-0001	new
Ductility Machine	1-1994	1-1994	Forma Scientific	2816	20457-16	new
Penetrometer	7/85	7/85	Precision Scientific	NA	44-851	new
Water Bath	1/91	1/91	Forma	2095 circulating	20974-092	new
Water Bath	1/91	1/91	2095 Forma	2095 cirulating	20962-35	new
Water Bath	1/91	1/91	Forma	circulating	20154-1392	new
Linear measuring:						
Caliper	3/97	3/97	Mitutoyo	CD-6" CS	50312	new
NIST Traceable Thermometers:						
ASTM 45F	94-95	94-95	Brooklyn	liquid in glass	2N359	new
minus 30 to 2C(62C)	94-95	94-95	Princo	liquid in glass	BBB09619	new
ASTM 63F	94-95	94-95	Brooklyn	liquid in glass	9161399	new
ASTM 96C	3-2001	3-2001	VWR	liquid in glass	3L0644	new
ASTM 13C	94-95	94-95	Brooklyn	liquid in glass	1D622	new
ASTM 19C	94-95	94-95	Brooklyn	liquid in glass	33849	new
ASTM 47F	94-95	94-95	Brooklyn	liquid in glass	54931	new
ASTM 110F	12/96	12/96	Princo	liquid in glass	689810	new
ASTM 94C	2-200	2-2000	A&M	liquid in glass	2024180	new
SERIES II MULTIMETER	8-2000	8-2000	Fluke	77	62610919	new
TURE RMS MULTIMETER	6-1999	6-1999	Fluke	8060A	663505	new
Pressure/Vaccum Transducer	6-1999	6-1999	Fluke	PV350	id# 2151A32	new
Rheometer Temp Probe	6-2001	6-2001	Cannon	9728-V95	DSR 100K/2246	new
Rheometer Temp Probe	10-1996	10-1999	Cannon	9728-V95	DSR 100K/1497	new
Electronic balance	7/86	7/86	Sartorius	1465MP8-2	44-873	new
Electronic Balance	9/93	9/93	Mettler	AE200S	44-1171	new
Electronic Balance	9/91	9/91	Mettler	PM-11N	44-1118	new

Note: Manufacturer's instructions may be found in this lab supervisor's office.

Bituminous Lab

Equipment Calibration and Verification Information
BITUMINOUS LAB

Equipment Item	Manufact-urer	Model #	Serial #	UDOT #	Calib/Verif Procedure Ref.	Interval (Months)	Last Calibration	Next Calibration	Calibration Responsibility	Date Rec'd	Date In-Service	Condition Rec'd
Analytic Balance	Mettler	PC-16	D42362	44-0637	UDOT	12	Jan-03	Jan-04	Starkie	1984	1984	New
Analitic Balance	Mettler	PE-16	D45600	44-864	UDOT	12	Jan-03	Jan-04	Starkie	1988	1988	New
Analytic Balance	Mettler	PM-11	G15383	44-0924	UDOT	12	Jan-03	Jan-04	Starkie	1991	1991	New
Analytic Balance	Mrttler	PM-3000K	21134658		UDOT	12	Jan-03	Jan-04	Starkie	1994	1994	New
Vacuum System	Welch Duo-Seal	1402 L-05	130542	44-1122	UDOT	6	Jan-03	Aug-03	Steve N.	1993	1993	New
Mechanical Shaker	Gilson	SS-12R	1004	44-615	UDOT	12	Jan-03	Jan-04	Steve N.	1985	1985	New
Oven (Gas)	Hussman Southbend	Marathoner	1165787	44-0972	UDOT	4	Jan-03	Jun-03	Steve N.	1988	1988	New
Oven (Eletric)	VWR Scientific	1645-D	N/A	44-1074	UDOT	4	Jan-03	Jun-03	Steve N.	1991	1991	New
Oven (Eletric)	VWR Scientific	1685	N/A	44-1143	UDOT	4	Jan-03	Jun-03	Steve N.	1993	1993	New
Water Bath # 1	VWR Scientific	1235 - PC	701593	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1993	1993	New
Water Bath # 2	VWR Scientific	1235 - PC	401193	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1993	1993	New
Water Bath # 3	VWR Scientific	1235-PC	202993	N/A	UDOT	6	Jul-03	Jan-04	Steve N.	1993	1993	New
Sieve 3/4"	Tyler	N/A	001323B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve 1/2"	Tyler	N/A	000134B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve 3/8 "	TYler	N/A	000116B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve No. 4	Tyler	N/A	002453B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve No. 8	Tyler	N/A	002457B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve No. 16	Tyler	N/A	002454B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve No. 30	Tyler	N/A	000163B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve No. 50	Tyler	N/A	000042B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve No. 100	Tyler	N/A	000169B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve No. 200	Tyler	N/A	002855B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve No. 16 (Washing Only)	Tyler	N/A	002850B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Sieve No. 200 (Washing Only)	Tyler	N/A	000167B	N/A	UDOT	6	Oct-02	Apr-03	G. Carter	1990	1990	New
Lab Timer #1	Cole-Parmer	N/A	21383236	N/A	UDOT	6	Jul-03	Jan-04	Steve N.	2002	2002	New
Lab Timer #2	Cole-Parmer	N/A	21383244	N/A	UDOT	6	Jul-03	Jan-04	Steve N.	2002	2002	New
Thermometer	Ertco	2F BF	96-180	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	Ertco	2F BF	96-158	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	VWR	2F	3242	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	Ertco	2F	C 96-116	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	Ertco	7F	L 95-800	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	Fisher	7F	IV9396	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	Brooklyn	7F	69710	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	Fisher	7F	2B5793	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	Ertco	7F	K 95-641	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	Fisher	17F	IS5898	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	Princo	17F	A00421	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New
Thermometer	Ertco	47F	1137	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1994	1994	New

Flow Gauge	Gilmont	2P	N/A	N/A	UDOT	12	Jan-03	Jan-04	Steve N.	1992	1992	New
Superpave Gyratory Compactor	Troxler	4140	203	N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1995	1995	New
Superpave Gyratory Compactor	Test Quip	BSCG 1		N/A	UDOT	6	Jan-03	Aug-03	Steve N.	1995	1995	New
Oven Electric	VWR SCIENTIFIC	1685	700398	44-1305	UDOT	4	Jan-03	Jun-03	Steve N.	1999	1999	New
Ignition Oven 1	BS Thermal Line				UDOT	12	Jan-03	Jan-04	G. Starkie	1991	1991	New
Ignition Oven 2	BS Thermal Line				UDOT	12	Jan-03	Jan-04	G. Starkie	1991	1991	New
Eletronic Thermometer	Fluke (on APA)	Model 52	6452269	N/A	UDOT	6	Jan-03	Aug-03	G.Carter	1994	1994	New
Eletronic Thermometer	Fluke(Oven)	Model 52	AA000537	N/A	UDOT	6	Jan-03	Aug-03	G. Carter	1994	1994	New
Eletronic Thermometer	Fluke(Oven)	Model 52II	76100287	N/A	UDOT	6	Jan-03	Aug-03	G.Carter	2002	2002	New
Superpave Gyratory Compactor	Pine	AFGB1 A	5195		UDOT	6	Feb-03	Sep-03	Steve N.			
Note: Calibration and verification records may be found in this lab supervisor's office.												

Chemistry Lab

Inventory

Utah Department of Transportation: Materials Division

Inventory of Major Equipment and Reference Materials

Chemistry Lab

Date: 12/04/2002

Equipment	Date Rec'd	Date in Service	Manufacturer	Model Number	Serial Number	UDOT Number	Condition when received
Infrared Spectrophotometer	1999	07/09/99	Shimadzu	8300	A20913600758LP	44-1312	new
Mass Spectrometer	0.00249750249750255	05/16/02	Agilent	5973N	US10442317	44-1357	
Gas Chromatograph	12/30/99	05/16/02	Agilent	6890N	US10208027	44-1357	new
Atomic Absorption Spectrometer	1991	1991	Perkin Elmer	3100	148202	44-1150	new
X-Ray Fluorescence Spectrometer	5-20-97	6-1-97	Oxford Instruments	MDX-1000	MX 1142	44-1259	new
CertiPrep Mixer/Mill	5-20-97	6-1-97	SPEX	8000	97023	44-1259-01	new
Hydraulic Press	5-20-97	6-1-97	Carver	C	41000-341	44-1259-02	new
Muffle Furnace - Large	1980	not in service	Thermolyne	F-1930-1	17201	59-40-677	new
Muffle Furnace - Large	04/11/00	04/11/00	Thermolyne	F48020	1058990220624		new
Muffle Furnace - Large	04/11/00	04/11/00	Thermolyne	F6000	1060000108824		new
Muffle Furnace - Small	1980	1980	Thermolyne	FB1415M	34802762	44-869	new
Muffle Furnace - Small	10-02-96	10-02-96	Thermolyne	FB1415M	746960706100		new
Hot Plate	1980	1980	Thermolyne	HP36025/VWR300	36000737		new
Hot Plate	1980	1980	Thermolyne	HPA1915B	06417808		new
Hot Plate	1980	1980	Thermolyne	HPA1915B			new
Hot Plate	1980	1980	Thermolyne	HPA1915B			new
Hot/Stir Plate	1980	1980	Thermolyne	SP - A1025B	670165		new
Hot/Stir Plate	04/23/01	04/23/01	VWR	357	2054		new
Incubator	12/05/98	12/08/98	Yamato	IC600	A6700039		new
Drying Oven	1980	1980	Lab-Line Instruments		0666	40-505	new
Drying Oven	1980	1980	Blue M Electric Co.	OV-185A	RP 416	59-40-645	new
Water/Oil Bath	1975	not in service	Lab-Line Instruments	3005-7	0269	59-40-288	new
Water/Oil Bath	1975	1975	Lab-Line Intsruments	3005-7	1065		new
pH Meter	1975	1975	Sargent-Welch	S-29999/NX	2509070	59-40-384	new
Analytical Balance	1993	1993	Mettler	AE163	C-01822	44-707	new
Top-loader Balance	03/18/02	03/18/02	Mettler Toledo	PB602S	1121082579		new
Pulverizer	5-88	5-88	BICO	UA53	67463	44-0945	new
Vacuum Pump	3-24-98	3-24-98	Gast	SA55NXGTE-4870	9710714031		new
Refridgerator	1980	1980	Frigitemp Corp	SS-65-ASCRTM	4110010078153	59-40-27	new
TCLP Extractor	1993	1993	Anal. Testing & Cons.		8054418	44-1132	new
Hot Plate	3-16-98	3-16-98	Thermolyne/Cimarec	HP47135	1073971142582		new
Hot Plate	3-16-98	3-16-98	Thermolyne/Cimarec	HP47135	1073971142575		new
Spectophotometer	7/98	7/98	Hach	DR20/10	980500008868	44-1291	new
Ion Chromatography system	06/08/98	07/12/98	Lachat/Zellweger	QuickChem 8000	A83000-1224	44-1290	new
Reagent Pump	06/08/98	07/12/98	Lachat/Zellweger	IC-110V	A8200-495	44-1290-02	new
Eluent Pump	06/08/98	07/12/98	Lachat/Zellweger	241485	A28911-455	44-1290-01	new
Top-loader Balance	pre-1978	not in service	Mettler	K7T	G-1236	59-40-562	new
Top-loader Balance	pre-1989	not in service	Mettler	P160N	313783	59-40-274	new
Analytical Balance	pre-1989	not in service	Ainsworth	Type 10	43635	59-40-27	new

Note: Manufacturer's instructions may be found in this lab supervisor's office.

Cement Lab
Inventory

Equipment Item	Manufacture	Model #	Serial #	UDOT #	Calibration Procedure Ref.	Interval (months)	Last Calibration	Next Calibration	Calibration Responsibility
QSM	UDOT								T. Peterson
Balances:									
Analytical	Mettler	PM 1200	SRN-J66801	44-1024	UDOT cp-sb	12	8/02	8/03	G. Starkie
Gen. Purpose	Mettler	PC 16	D42362	44-0637	UDOT cp-sb	12	12/02	12/03	G. Starkie
Thermometers:									
Glass - 300 F	Sargent	ASTM 1F	43952		UDOT cp-th	6	10/02	4/03	G. Carter
Glass - 300 F	VWR	ASTM 1F	600875		UDOT cp-th	6	10/02	4/03	G. Carter
Glass - 580 F	ERTCO	ASTM 2F	G77737		UDOT cp-th	6	10/02	4/03	G. Carter
Glass - 305 C	ERTCO	ASTM 69C	1901		UDOT cp-th	6	10/02	4/03	G. Carter
Glass - 80 F	VWR	ASTM 17F	A01604		UDOT cp-th	6	10/02	4/03	G. Carter
Sieves:									
#20, 12" Screen	Tyler		X002016		UDOT cp-sv	6	10/02	4/03	G. Carter
#20, 12" Screen	Tyler		X100171		UDOT cp-sv	6	10/02	4/03	G. Carter
#20, 12" Screen	Tyler		X000728		UDOT cp-sv	6	10/02	4/03	G. Carter
#16, 8" Screen	Fisher Scien.		X002746		UDOT cp-sv	6	10/02	4/03	G. Carter
#20, 8" Screen	Fisher Scien.		X002019		UDOT cp-sv	6	10/02	4/03	G. Carter
#40, 8" Screen	Fisher Scien.		X000745		UDOT cp-sv	6	10/02	4/03	G. Carter
#50, 8" Screen	Fisher Scien.		X002017		UDOT cp-sv	6	10/02	4/03	G. Carter
#100, 8" Screen	Fisher Scien.		X002018		UDOT cp-sv	6	10/02	4/03	G. Carter
#20, 8" Screen	Endecott		X100173		UDOT cp-sv	6	10/02	4/03	G. Carter
#20, 8" Screen	Endecott		X100172		UDOT cp-sv	6	10/02	4/03	G. Carter
#30, 8" Screen	Sargent		X100782		UDOT cp-sv	6	10/02	4/03	G. Carter
#4, 8" Screen	Sargent		X100725		UDOT cp-sv	6	10/02	4/03	G. Carter

#8, 8" Screen	Fisher Scien.		X000730		UDOT cp-sv	6	10/02	4/03	G. Carter
325 sieve cups (1-9)	Humboldt				See ASTM C-430	After 5 uses	10/02		R. Davis
Drying Oven	Blue M	SW-11TA-1	SW-4376						
Autoclave	Boekel	95-50-11		44-1222	CCRL inspection used	30	12/02	6/05	CCRL
Molds:									
2x2" Cube	Humboldt		Y-3608		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3609		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3610		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3611		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3612		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3613		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3614		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3615		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3616		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3617		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3618		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3619		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3620		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3621		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3622		CCRL inspection used	30	12/02	6/05	CCRL
2x2" Cube	Humboldt		Y-3623		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		E-7533		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		R-749		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		R-750		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		S-4119		CCRL inspection used	30	12/02	6/05	CCRL

Cone Molds	Humboldt		W-2251		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		W-2252		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		W-2253		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		W-2254		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		W-2256		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		W-2257		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		W-2258		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		W-2259		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		Y-2161		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		Y-2162		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		Y-2164		CCRL inspection used	30	12/02	6/05	CCRL
Cone Molds	Humboldt		Y-870		CCRL inspection used	30	12/02	6/05	CCRL
Autoclave Molds	Soil Test				CCRL inspection used	30	12/02	6/05	CCRL
Autoclave Molds	Humboldt	9252			CCRL inspection used	30	12/02	6/05	CCRL
Moist Cabinet	Forma Scientific	3911	99343-97	441326	CCRL inspection used	30	12/02	6/05	CCRL
Blaine Apparatus	Humboldt		S4200		CCRL inspection used	30	12/02	6/05	CCRL
Flow Table	Humboldt			44-0292	CCRL inspection used	30	12/02	6/05	CCRL
Vicat Apparatus	Humboldt		W2248		CCRL inspection used	30	12/02	6/05	CCRL
Mech. Mixer	Hobart	N-50	31-1167-616		CCRL inspection used	30	12/02	6/05	CCRL
400 ml. Cup					CCRL inspection used	30	12/02	6/05	CCRL
Comp. Machine	Satec	Mark III	2500GP1878	441330	UDOT cp-ct	12	12/02	12/03	G. Starkie
N.C. Apparatus	Fisher Scien.		A602		CCRL inspection used	30	12/02	6/05	CCRL
Comparator	Humboldt			44-0398	CCRL inspection used	30	12/02	6/05	CCRL
No. 325 Nozzle					See ASTM C-430	6	12/02	6/03	R. Davis

Blaine Standard	NIST	114p			See ASTM C-204	6	12/02	6/03	R. Davis
Bearing Blocks					UDOT cp-ct	12			G. Starkie
Std. Sand	AcuSand	C-109+20/30			See ASTM C-778	upon recieval			R. Davis
Record. Therm.	VWR	ASTM 17F	A01604		See ASTM C-511	6	12/02	6/03	R. Davis

Structures and Concrete Lab

Inventory

Equipment Item	Manufactuter	Model #	Serial #	UDOT #	Cal./Verif. Proc.Ref	Inter Month	Last Cal. Calibration	Next Calibration	Calibration Person	Date Rec'd	Date in Service	Condition when Rec'd
Large Press	Reihle	FH-450	R-94251		UDOT cp-ct	12	12/02	12/03	Graham Starkie	1960	1960	New
Reinforcing Steel Bender	UDOT	N/A	None		UDOT				Robert Winters	1985	1985	New
Skidmore Machine	Skidmore-Wilheim	ML	9136		UDOT				Robert Winters	01/01/81	01/01/81	New
Rockwell Hardness Tester	Wilson Instrument	4YR a	367		UDOT				Robert Winters	06/01/75	06/01/75	New
Large Scale	Neweigh	S20T	45307	40-0181	UDOT cp-sb	12			Graham Starkie	01/01/81	01/01/81	New
Extensometer	Tinius Olson	S-8187	180976		UDOT cp-ct				Robert Winters			New
Instron Press	Instron	1000	2703		UDOT cp-ct	12	Out of Service		Graham Starkie	03/15/83	03/20/85	New
Mullen Tester	BF Perkins	N/A	8205-84-1994		UDOT				Robert Winters	1968	1968	New
Satec Press	Satec	Apex T10000	1064		UDOT cp-ct	12	Out of Service		Graham Starkie	1996	1996	New
Shore Durometer	Shore Instrument	A-2	70810		UDOT				Robert Winters	1978	1978	New
Slump Cone	Humboldt			CL-1	UDOT cp-sc	12	01/03	01/04	Bill Lawrence	1999	1999	New
Slump Cone	Humboldt			CL-2	UDOT cp-sc	12	01/03	01/04	Bill Lawrence	1999	1999	New
Slump Cone	Gilson	HM-45		CL-5	UDOT cp-sc	12	01/03	01/04	Bill Lawrence	2003	2003	New
Concrete Pressure Meter	Watts			BZ-05	UDOT cp-am	12	03/02	03/03	Gerald Carter	2002	2002	New
Concrete Pressure Meter	Watts			CL-34	UDOT cp-am	12	09/02	09/03	Gerald Carter	2002	2002	New
Concrete Pressure Meter	Watts			CL-35	UDOT cp-am	12	03/03	03/04	Gerald Carter	2002	2002	New
Concrete Pressure Meter	Watts			CL-60	UDOT cp-am	12	02/02	02/03	Gerald Carter	2002	2002	New
Concrete Pressure Meter	Watts			CL-61	UDOT cp-am	12	02/02	02/03	Gerald Carter	2002	2002	New
Concrete Pressure Meter	Watts			CL-62	UDOT cp-am	12	12/02	12/03	Gerald Carter	2002	2002	New
Concrete Pressure Meter	Watts			CL-63	UDOT cp-am	12	02/03	02/04	Gerald Carter	2002	2002	New
Concrete Pressure Meter	Watts			CL-72	UDOT cp-am	12	02/03	02/04	Gerald Carter	2002	2002	New
Concrete Pressure Meter	Watts			40-812	UDOT cp-am	12	02/03	02/04	Gerald Carter	2002	2002	New
Concrete Pressure Meter	Watts			40-821	UDOT cp-am	12	02/02	02/03	Gerald Carter	2002	2002	New

Equipment Calibration Procedures

Air Meters (cp-am)

Type of Equipment: Pressure Meter

AASHTO T 152, C 231

Purpose: To verify the accuracy of a pressure type air meter.

Inspection Equipment

1. Threaded straight tubing
2. Threaded bent tubing
3. Syringe

Procedure

1. Fill the base with water.

2. Screw the short piece of straight tubing into the threaded petcock hole on the underside of the cover.
   Clamp cover on the base with the tube extending down into the water.

3. With both petcocks open, add water with a syringe through the petcock having the pipe extension below, until all air is forced out through the opposite petcock. Leave both petcocks open.

4. Pump up air pressure to a little beyond the predetermined initial pressure line. Wait a few seconds for compressed air to cool to normal temperature and then stabilize the gauge hand at the proper initial pressure line by pumping or bleeding off air as needed.

5. Close both petcocks and immediately press down on the thumb lever exhausting air into the base.
   Wait a few seconds until the hand is stabilized.
   If all the air was eliminated and the initial pressure line was correctly selected, the gauge should read 0%.
   If two or more tests show a consistent variation from 0% in the result, then change initial pressure line to compensate for the variation. Use the newly established "initial pressure" line for subsequent tests.

6. Screw curved tube into the outer end of petcock.
   Pressing on thumb lever and controlling flow with petcock lever, fill the 5% calibrating vessel (345 ml) level full of water from the base.

7. Release the air at the free petcock. Open the other petcock and let the water in the curved pipe run back into the base. There should be 5% air in the base.

8. With petcocks open, pump air pressure in exact manner as outlined in paragraph 4. Close

petcocks and immediately press the thumb lever. Wait a few seconds for exhaust air to warm to normal temperature, and for the needle to stabilize. The dial should now read 5%.

9. If two or more consistent tests show that the gauge reads more or less than 5% air by .2% (or whatever is considered satisfactory), then remove gauge glass and reset the dial hand to 5% by turning the recalibrating screw located just below and to the right of the center diameter.

10. When gauge hand reads correctly at 5%, additional water may be withdrawn in same manner to check results at 10%, 15%, 20%, and so on.

Brass Rings and Assembly (cp-br)

T-53

Purpose To measure the physical dimensions of the brass ring assembly.

Inspection Equipment Required

1. Balance capable of weighing 2000 g., readable to 0.001 g.
2. Calipers readable to 0.01 mm.

Tolerance Tolerances can be found in the test method listed above.

Procedure

1. With calipers, measure and record the dimensions for the rings, as shown in T-53 fig. 1(a).

2. With calipers, measure and record the dimensions for the ring holder, as shown in T-53 fig.1(b)

3. With calipers, measure and record the dimensions for the ball centering guide as shown in T-53 fig.1 (c).

4. With calipers, measure and record the diameter of the two steel balls.

5. On a balance or scale, weigh each ball and record the weights.

CBR Annular and Slotted Weights (cp-cbr) and Penetration Piston

T193/D1883

Purpose To measure critical dimensions and weights of the CBR Annular and Slotted Weights.

Inspection Equipment Required

1. Ruler readable to the nearest 1/16 inch.
2. Balance, capacity 15 lbs., readable to 0.01 lbs.

Tolerance: CBR annular and slotted weights and penetration piston must meet the dimensional tolerances and be within the specified weight tolerances as specified in the test method.

Procedure

1. Measure and record the dimensions of each weight.

2. Weigh and record the weight of each weight.

3. Measure and record the penetration piston shaft diameter and the penetration piston length.

Compression or Loading Device (cp-ct)

T193/D1883, T208/D2166, T216/D2435, T234/D2850, T236/D3080

Purpose

To check the critical components of compression loading devices used in the above referenced testing methods.

Inspection Equipment Required

A load cell which is calibrated to the accuracy required for the specific compression device and test method.

Tolerance

The equipment will meet the tolerances specified in the test methods referenced above.

Procedure

1. Insert calibrated load cell and compression device where the pressure is applied.
2. Observe and record compression device load indications throughout the range of the loads required for the test methods referenced above according to AASHTO T67.
3. Verify that applications of loads can be applied within the time limits specified in the above referenced test procedures.

Compressive Strength of Cylindrical Concrete Specimens Using Neoprene Caps

T22-92, D2000

Purpose To test compressive strength of cylindrical concrete specimens using neoprene caps instead of sulphur caps.

Inspection Equipment Required

As required in ASTM-D2000 and AASHTO-T 22-92.

Procedure The procedure followed is detailed in the main test method, (AASHTO T22-92, Sec. 7 and ASTM C39-86), modified as noted below:

1. Place an extrusion controller which contains a neoprene cap on the top and bottom surfaces of the concrete cylinder.
   With the neoprene caps in contact with the concrete cylinder, carefully align the axis of the specimen with the center of thrust of the spherically seated block.
   Bring the bearing blocks of the machine in contact with both of the extrusion controllers.

2. Do not allow loose particles to become trapped
   a. between the concrete cylinder and the neoprene caps
   b. or between the bearing surfaces of the extrusion controllers and the bearing blocks of the test machine.

3. Use the same surface of each neoprene cap to contact the concrete cylinders for all tests performed with that cap.
   Each neoprene cap must not be used to test more than 100 cylinders.
   The life of alternate pads must be verified by the agency or purchaser.

Compressive Testing Machine (cp-ct)

T 22-92, C 39-86

Purpose To identify calibration mode and type

Inspection Equipment Required

1. Calibrate load cells with meter readable to + 1%
2. Calipers, Straight Edge, Feeler Gauge

Tolerance

1. Tolerance of + 1%

Procedure

1. Apply a compressive axial load to molded cylinders or cores at a rate which is within a prescribed range until failure occurs.

   As per AASHTO T 67-85 Section: C. Verification by Elastic Calibration Device. Subsection: 13, 14 and 16-20

Scope

1. **Elastic Calibration Device**

   A device for verifying the load readings of a testing machine which has:

   (a) elastic member(s) to which loads may be applied, combined with

   (b) mechanism or device for indicating the magnitude (or a quantity proportional to the magnitude) of deformation under load.

Concrete Test Molds (plastic) (cp-m)

ASTM C-470-94/AASHTO M 205

Purpose Inspect and test concrete molds for compliance to industry standards.

Inspection Equipment Required

See ASTM C-470.

Tolerance Molds must meet test requirements in ASTM C-470.

Inspecting new molds

1. Selection: At least three molds must be tested per shipment selected randomly.

2. Test each mold selected following ASTM C-470 procedures. If the molds tested from a particular box meet the ASTM C-470 requirements, it is assumed that all the other molds in the box are also good, and no further testing is necessary for that box.

3. If at least one of the selected molds in a box fails to meet ASTM C-470 requirements, it is assumed that several other molds in that box fail. No further testing is done, and the entire box is rejected and returned to the supplier.

4. If three boxes in the entire shipment are rejected, the whole shipment is rejected and returned to the supplier. No further testing for the shipment is necessary.

Testing New Concrete Molds

1. Molds: Meet AASHTO M-205, Section 6.
   - < Constructed in the form of right circular cylinders which stand with the cylindrical axis vertical and the top open to receive the concrete.
   - < They must be made of materials that do not react with concrete containing portland or other hydraulic cements.
   - < They must be watertight and sufficiently strong and tough to permit their use without tearing, crushing, or deforming.

2. Test Procedure:
   a. Fill mold with water to 90 or 95 percent full.
   b. Subject mold to tapping & jarring.
   c. Let stand 1 hour.
   d. Examine the mold for leaks (especially the air hole at the bottom of the mold.)

3. Examine outside the mold for curvature of the bottom. Any noticeable concave (inward curvature) or convex (outward curvature) is cause for rejection.

Reused Concrete Molds

The Materials Division does not currently reuse molds because of a high potential for problems such as water leakage, cracks, stretched diameter from extruding the first concrete cylinder under pressure, and other damage.

Conicle Molds and Tamper (cp-cm)

T84/C128

Purpose To measure critical dimensions of the sand cone and tamper used in AASHTO T84 or ASTM C128.

Inspection Equipment Required

1. Calipers or ruler readable to 1 millimeter.
2. Balance, 500 gram capacity, readable to 0.1 gram.
3. Straight edge or ruler.

Tolerance The equipment must meet the dimensions and weights as specified in the test method.

Procedure **Cone**

1. Use the calipers to measure the inside diameter at the top of the cone to the nearest 1 millimeter, taking two readings 90E apart.
   Record the results.
2. Invert the cone. Repeat step #1 using the ruler.
3. Place the cone on a flat glass surface. Measure and record the depth of the cone by using the calipers and a straight edge or ruler.
   Record the results.
4. Measure the thickness of the cone to the nearest 1 millimeter by taking two readings 90E apart at the top of the cone and two readings 90E apart at the bottom of the cone.
   Record the results.

Tamper

1. Measure and record the diameter of the tamping face to the nearest millimeter by taking two readings 90E apart using the calipers.
   Record the results.
2. Determine and record the mass of the tamper to the nearest 0.1 gram.

Direct Tension Machine (cp-dtt)
AASHTO T-314

Purpose To (a) calibration and verification of the Direct Tension Machine

Inspection Equipment Required

1. Verification standard spring for load cell and displacement transducer
2. ASTM 62 C calibrated thermometer with 0.1 EC increments

Tolerance

The Load cell, displacement transducer and temperature shall meet the accuracy requirements specified in the applicable test methods listed above.

Procedure

1. A specially designed standard (spring) shall be used to verify the operation of both the load cell and the displacement transducer. The verification standard shall have a spring rate of approximately 135 N/m and shall be capable of withstanding a 500 Newton load without damage. The The manufacturer, Instron, shall supply verification standard. Instron must provide a certificate which guarantees the NIST traceability of the standard to be used. Verify calibration of the load cell and displacement transducer at least every 6 months and when measurements are suspect.

2. Verification of elongation rate- shall be verified using the verification standard (spring). The measurement shall be made at -18 EC. Allow ten minutes for the verification standard to achieve thermal equilibrium prior to running the test. To verify the elongation rate, elongation shall be plotted as a function of elapsed time. The resulting plot shall be a straight line with a slope 1.00 mm/min.

3. Temperature Detector- the temperature detector shall be calibrated as a minimum once each year. Calibration must be done at each temperature used. Direct contact between the RTD and temperature calibration device. If not agreeing, within 0.1 EC, correction applied or further calibration or maintenance must be performed. Calibrate using the same thermometer as above. Adjust the offset on the bath to correct temperature discrepancies.

4. Using the Instron "Test Specification and Procedure for doing the Verification"

located in the equipment folder, verify the following acceptance criteria:

C Acceptance Criteria for Customer's Machine

The Mean Load and Strain (maximum for each test) must fall within the following tolerances. The test is performed at 3%/min under strain control and is commanded to stop at 1% strain.

Coefficient of variation for the load must be 1.0% or less. This is as much a factor of careful specimen set-up as of actual machine variation. For each of

the following parameters, determine the difference between the mean values that were previously determined for the specimen and the values that resulted in testing the machine:

Error= Mean value from Specimen Certificate- Mean Value for machine

	Error Tolerance
Load	± 1.0 N
Strain 1	± 0.0001 % (based on Gage Length of 33.8)

All other values: Modulus, Stress, time of test, Extension, etc. should be within 6%.

- Interpretation of results

1. The load reading is outside the ± 1.0 N required by the certificate:

   This may be due to a shift in calibration of the load cell, or the LVDT caused by loads induced by the method of attachment, or cantilever loads on the load cell. In this case the LVDT and Load cell must be calibrated independently without removing them from the machine. See separate test specifications for this.

2. The CV for the test is larger than 1.0%

This may be due to:

a. The grip is not well aligned with respect to the base- use alignment disk screws to adjust.
b. Slack in the load train- check belt tension, check that the ball screw nut is tight, check for proper preload of the ball bearing nut.
c. Bent Verification Specimen- check for flatness

3. Time of test, or Extension is out by more than 6%

a. Some of the same problems listed above may apply
b. Check if the speed is set to 3%/min, and is under strain 1 control, set to stop at 1%
c. Check if the proper loadframe has been selected in Merlin setup(5525 or 55BTI)
d. If a 55BTI is being tested, the extension may vary by 10% from what is shown on the original test results on the certificate. Some but other values should still fall with 6%.

Ductility Apparatus (cp-da)
AASHTO T51, ASTM D113

Purpose To verify the accuracy of equipment used to perform the ductility test.

Inspection Equipment Required

1. Ruler, readable to 1 mm.
2. Timer, readable to 0.1 sec.
3. Thermometer, calibrated and readable to 0.5EC.
4. Calipers readable to 0.0001"

Tolerance

The equipment must meet the tolerances specified in test methods T 51 and D 113.

Procedure

1. For each travel speed, begin with head at zero mark and note the time to travel each 10 mm increment for a total of 150 mm.
2. Calculate travel speed for each 10 mm increment. Determine average and compare with total travel speed for 150 mm. If the calculated average and total are within 0.50 mm per minute, record the total length and time data as travel speed to the nearest 0.1 mm/min.
3. Measure with a scale the depth and height of water above and below the mold.
4. Visually inspect machine for wear on any parts, loose bolts, leaks, etc....
5. Observe and record the temperature of the water in the bath
6. Measure and record the depth of water in the bath

Molds

7. Assemble a mold.
8. Measure and record the ID of the mold.
9. With the mold assembled, measure and record:
   - a distance between centers. (Fig 1, T51)
   - b total length of the mold
   - c distance between clips
   - d shoulder
   - e width at minimum cross-section
   - f width at the mouth of the clip
   - g thickness of the mold

Dynamic Shear Rheometer (DSR)

AASHTO TP5 (DSR)

Purpose To measure the critical temperatures and torque motor response of the instrument used in AASHTO TP5.

Inspection Equipment Required

1. 2 mm thick by 25 mm diameter silicone thermistor calibrated to the nearest 0.1 EC.
2. Cannon Reference Fluid

Tolerance Equipment must meet the temperature and accuracy tolerances specified in the applicable test method.

Procedure

1. Compare temperature measurements obtained from the calibrated silicone wafer, thermistor and the DSR RTD.
   Using the temperature measured by the thermistor as a reference temperature, apply an appropriate temperature correction to the temperature measurement indicated by the DSR RTD if they do not agree within ± 0.1EC.

2. Measure and record the modulus and viscosity of the Cannon Reference Fluid.

Flash Cleveland Open-Cup (cp-fc)
AASHTO T48

Purpose To verify dimensional tolerances of the Flash Cleveland Open Cup.

Inspection Equipment Required

1. Calipers, readable to 0.01 mm

Tolerance The dimensions must meet the tolerances in test method T48.

Procedure

With the calipers:

1. Measure and record outside diameter of the cup at its base.

2. Measure and record the inside diameter of the cup at its base.

3. Measure and record the thickness of the bottom of the cup.

4. Measure and record from the top of the cup to the fill mark inside the cup.

5. Measure and record the outer diameter of the shoulder.

Flash Point Tag Open-Cup (cp-fp)
AASHTO T79

Purpose To verify physical dimensional tolerances of the Flash Point Tap Open Cup.

Inspection Equipment Required

1. Calipers, readable to 0.01 mm
2. Balance, 2000 g capacity, readable to 0.01 g.

Tolerance The dimensions must meet the tolerances in the test method listed above.

Procedure

With calipers:

1. Measure and record the height of the cup.
2. Measure and record the distance from the top of the cup to just under the rim on top.
3. Measure and record the diameter of the cup just under the ridge.
4. Measure and record the diameter of the cup just before it starts curving at the bottom.
5. Measure and record the depth of the cup in the center.

With balance:

6. Weigh and record the weight of the cup.

Flow Gauges (cp-fg)
AASHTO T170, T240

Purpose To verify the accuracy of the flow gauges used to control of the flow rate of air or carbon dioxide gas.

Inspection Equipment Required

1. Large volumetric flask, or other container, 1000-ml capacity or larger.
2. Gas flow meter, capable of indicating a gas flow of up to 1000 ml per min for CO_2 and 4000 ml for air.
3. Timing device readable to 0.1 s and accurate to within 0.1 s for a 60.0 s interval
4. Water bath, of sufficient size to immerse the volumetric flask.
5. Thermometer, ASTM 17C or 17F.
6. Convenient source of air or carbon dioxide gas.

Tolerance

Flow gauges must be capable of maintaining a flow rate of approximately 900 ml per min for CO_2 or 4000 ± 200 ml per min for air.

Procedure

1. Accurately measure the total volume of water in the flask.
2. Fill the both the water bath and the flask with water at 25 C ± 1E.
3. Cover the flask, invert it, and immerse it into the bath. Do not allow any air to remain in the flask.
4. Start the flow of air or carbon dioxide and set the gauge to the desired flow rate.
5. Immerse a tube connected from the flow gauge into the bath.
   Start the timer at the same instant the tube outlet is place into the flask.
6. Stop the timer when all the water has been displaced from the flask.
7. Calculate the flow rate.
8. Re-set the flow gauge to a slightly higher pressure and repeat steps 2 through 7.
9. Re-set the flow gauge to a slightly lower pressure and repeat steps 2 through 7.
10. On graph paper, plot the points of actual flow versus the gauge reading from each test. From the plot, determine the reading that indicates the desired flow.

Kinematic and Absolute Viscosity Bath (cp- kvis)

T201, T202

Purpose To verify that the operating temperature of the bath varies no more than 0.06 EC.

Inspection Equipment Required

1. NIST traceable thermometer

Tolerance Tolerances are found in test methods T201 and T202.

Procedure

1. Turn on the viscometer bath and allow it to come to test temperature
2. Leave the bath on a minimum of four hours
3. Record temperatures at half-hour intervals

LA Abrasion Machine (cp-la)

AASHTO T96/C131

Purpose To (a) measure the critical dimensions and general operating conditions of the LA Abrasion Machine, and
(b) measure the mass of the spheres used as test charges.

Inspection Equipment Required

1. Steel rule readable to 1/16 inch (1 millimeter).
2. Stop watch readable to 0.1 second.
3. Balance with a 5 kilogram capacity readable to 1 kilogram.

Tolerance The LA machine must meet the dimensional tolerances specified in the applicable test method listed above and must be in good operating condition.
The steel spheres used to charge the LA machine must meet the mass tolerances specified in the applicable test method listed above.

Procedure **LA Machine**

1. Measure and record the inside diameter of the drum at the left and right edges to the nearest millimeter.
2. Measure and record the width and height of the opening to the nearest millimeter.
3. Measure and record the wall thickness at the left and right edge to the nearest 1/16 inch.
4. Determine if the cylinder is horizontal using a steel ball to check left to right roll.
5. Measure and record the shelf width inside the drum to the nearest 1/16 inch.
6. Measure and record the distance from the shelf to the opening in the direction of rotation.
7. Using a stop watch, determine the rpm to the nearest whole number over a five minute period; record the rpm.
8. Check that the number of revolutions is 500 by looking at the counter on the machine.

Steel Spheres

1. Determine and record the mass of each individual sphere to the nearest 1 gram.
2. Determine and record the mass of the collective charges to the nearest 1 gram.

Liquid Limit Device and Grooving Tool (cp-llg)

T89/D4318

Purpose To inspect the physical condition and measure the critical dimensions of the liquid limit device and grooving tool.

Inspection Equipment Required

Calipers capable of measuring the critical dimensions readable to 0.001 inch.

Tolerance The critical dimensions of the liquid limit device must meet the dimensional tolerances specified in the test method.

Procedure

1. Measure and record the dimensions of the liquid limit device as indicated on figure 1 of the above test specification.

2. Inspect the liquid limit to determine that
   a. the device is in good working order
   b. the pin connecting the cup is not worn sufficiently to permit side play
   c. the screws connecting the cup to the hanger arm are tight
   d. points of contact on the cup and base are not excessively worn
   e. the lip of the cup is not excessively worn
   f. a groove has not been worn in the cup through long usage.

Note 1: Wear is considered excessive when

1) the point of contact on the cup or base exceeds approximately 13 mm (0.5 in.) in diameter, or
2) when any point on the rim of the cup is worn to approximately ½ the original thickness.

Although a slight groove in the center of the cup is noticeable , it is not objectionable. **If the groove becomes pronounced before other signs of wear appear, the cup should be considered excessively worn, and should be replaced.**

3. The rate of shocks of mechanically operated liquid limit devices should be similar to manually operated devices at about 2 revolutions per second.

4. With calipers, measure and record the dimensions of grooving tool and end gauge.

Manual Compaction Hammer (cp-mh)

T99/D698, T180/D1557

Purpose To measure the critical dimensions of the Proctor Hammers.

Inspection Equipment Required

1. Calipers readable to 0.001 inch.
2. Tape measure readable to 1/16 inch.
3. Balance, capacity 5 kilograms, readable to 1 gram.

Tolerance Equipment must meet the dimensional tolerances specified in the applicable test method.

Procedure

1. Using the calipers, measure the diameter of the rammer face determined by taking 2 readings 90E apart. Record the results.

2. Pull up the handle, and use the tape measure to measure the drop height of the hammer. Determine this height inside the guide sleeve. Record the results.

3. Remove the hammer from the guide sleeve; determine its mass with the balance and record the finding to the nearest 1 gram.

4. Using the calipers measure and record the diameters of the vent holes near the end of the hammer.

Marshall Hammer (cp-marh)
T-245

Purpose: To measure and compare mechanical and manual compactors.

Equipment Used:

1. Balance readable to 0.1 g
2. Tape measure of 18 inch straight edge readable to 1/16 inch
3. Calipers readable to .0001

Tolerance: As per AASHTO T-245, The difference between the two hammers should not exceed .5 lbs.

Procedure:

1. Dismantle the sliding weight. Weigh and record the weight.

2. Re-assemble the sliding weight and measure the distance from the bottom fo the handle to the top of the weight. Record this distance.

3. With calipers, measure and record the diameter of the compaction face.

4. Correlate the manual and mechanical hammers every 12 months. The difference between the two hammers should not exceed 0.5 pounds.

Marshall Mechanical Compactor (cp-mmc)

Purpose

Inspection Equipment Required

1. Hand operated hammer
2. Mechanical operated hammer

Tolerance Equipment must meet the dimensional tolerances specified in the applicable test method.

Procedure

1. Use the same aggregate, asphalt percentage, temperatures, and the amount of blows for steps two and three.

2. Compact marshall specimens with mechanical compactor and record the data.

3. Compact marshall specimens with a hand compactor and record the data.

Marshall Stability & Flow Test Apparatus (cp-mt)
T-245

Purpose To measure the rate of compression and the accuracy of the Marshall Stability instrument graph.

Inspection Equipment Required

1. Ruler
2. Stopwatch.
3. A load cell capable of at least 5000 lbf capacity and sensitive to 10 lbf up to 1,000 lbf and 25 lbf between 1,000 and 5,000 lbf and equipped with a micrometer dial. This compares the readings of the load cell to the rate of movement shown on the instrument graph.

Tolerance AASHTO T-245: Loading Jack with uniform vertical movement of 50.8 mm/min. and the flowmeter with gauge of .25mm divisions.

Procedure

1. Use the ruler to measure the vertical movement of loading jack and horizontal movement on the instrument graph within 30 seconds after starting the timer.

   Use the stopwatch to time the amount of movement of the test head on the loading jack. It must move 2 inches in 60 seconds.

2. Use the load cell to measure the pounds of force applied.

   Compare readings of the load cell to the rate of movement shown on the instrument graph to verify the accuracy of pounds reading on the graph.

Marshall Molds and Breaking Head (cp-mmbh)
T 245

Purpose To verify the dimensions of the Marshall Molds and breaking head.

Inspection Equipment Required

1. 6" Calipers capable of measuring an inside diameter of 4" and readable to 0.0001"
2. Template with a radius of 2" inner curvature

Tolerance The equipment will meet the tolerance levels specified in AASHTO T-245.

Procedure:

1. Measure and record the inside diameter of the mold to the nearest 0.0001".
2. Rotate the mold 90 degrees. Measure and record the results again.
3. Place the template into each half of the breaking head.
4. Observe any gaps, record findings.

Mechanical Compactor (cp-mc)

T99/D698, T180/D1557

Purpose To measure the critical dimensions of mechanical compactors.

Inspection Equipment Required

1. Calipers readable to 0.001 inch.
2. Tape measure readable to 1/16 inch.
3. Balance, Capacity 5 kilogram, readable to 1 gram.

Tolerance Equipment must meet the dimensional tolerances specified in the applicable test method.

Procedure

1. If circular face is used, measure with calipers and record the diameter of the rammer face by taking 2 readings 90E apart. If a sector face is used it must have an area equal to that of a circular rammer face**.**

2. Using the ruler, measure the drop height of hammer. Record the finding.

3. Using the balance, measure the hammer mass and record the measurement to the nearest 1 gram.

Mechanical Shaker (cp-ms)

AASHTO T11/C117, T27/C136, T88

Purpose To measure sieving's thoroughness.

Inspection Equipment Required

1. Soil or aggregate sample.
2. Balance accurate to the weights specified and of adequate capacity for the respective test methods.

Tolerance

Verify the sieving times so that the percent passing any sieve during one minute of sieving is in accordance with the value specified in the respective test procedures.

Procedure

1. Prepare soil or aggregate sample to be sieved in accordance with the respective above referenced specifications.

2. Perform sieving procedure with the mechanical shaker as many times as is customarily used for the respective test procedure.

3. Weigh and record individual sieves to determine weight of sample retained in individual sieves.

4. Use mechanical shaker to shake each individual sieve for one minute.

5. Weigh and record the individual sieves to determine the percentage of sample lost during the shaking.

Moist Cabinets, Rooms, and Water Storage Tanks (cp-mcr)
C-511-93

Purpose To verify that requirements for moist cabinets, moist rooms, and water storage tanks used for storage of paste, mortar, and concrete test specimens are being met.

Inspection Equipment Required

1. Equipment used in ASTM C-511-93.

Moist Cabinets - General

< Maintain the atmosphere in a moist cabinet at a temperature of 73.4 ± 3EF and a relative humidity of at least 95% at all times.
< Provide wet and dry recording thermometers for all storage units.
< Ensure that the shelves which hold the fresh specimens are level.
< Provide cabinets that are constructed of durable materials that have tightly fitting doors.
< Maintain the specified relative humidity with one or more fog sprays, water sprays, or curtains of water on the inner walls that are directed so that the water will collect in a pool at or near the bottom of the moist storage section.
< Provide automatic control of air temperature where a cabinet is located in a non air-conditioned work room, or where maintaining temperatures within the specified range is difficult.

Moist Cabinets - Monitoring Temperature and Humidity

< Take periodic readings from the wet and dry thermometers each day with a minimum of once a day.
< Record each reading and the time the reading is taken.
< Determine that the readings are within the specified temperature and humidity range.
< If the readings fall outside the acceptable range, adjust the mechanisms on the cabinet to bring the readings into the appropriate range.
< Avoid taking humidity readings when saturation is typically below optimum, such as directly after specimens are placed in or removed from the storage unit.

Moist Room - General

< Maintain the ambient air in a moist room at a minimum temperature of 68E F and a maximum temperature of 82.5EF, and a humidity of at least 50% at all times.

Molds - Soil Testing

T99/D698, T180/D1557, T193/D1883

Purpose To measure the critical dimensions of 4, 6, and 8 inch molds used in soil testing.

Inspection Equipment Required

1. Calipers capable of measuring the height and inside diameter of the molds readable to 0.001 inch.

Tolerance

The height and diameter of the molds measured must meet the dimensional tolerance as specified in the applicable test method listed above.

Procedure

With the calipers:

1. Measure the inside diameter of the mold to the nearest 0.001 inch. Record the results. Rotate the mold 90E (1/4 turn) and measure the inside diameter again. Record the results.

2. Turn the mold over and repeat step one.

3. Measure the height of the mold to the nearest 0.001 inch. Record the results. Rotate the mold 90E (1/4 turn) and measure the height again. Record the results.

Oven, General Purpose (cp-gpoven)

Purpose To verify the accuracy of dial settings on general-purpose drying ovens.

Inspection Equipment Required

1. A calibrated thermometer graduated in 1.0E C increments having a range which includes the temperature range to be checked.

2. A brass thermometer well to retain heat while the oven door is open. This is essential for a constant temperature reading.

3. A clothes pin to hold the thermometer in such a manner as to enable the operator to read the scale easily from outside or inside the oven.

Tolerance Drying ovens must be capable of maintaining a constant temperature range listed in the appropriate test methods.

Procedure

1. Place the thermometer inside the brass well with the clothes pin attached to the thermometer. Position the thermometer on the shelf where the samples are normally dried.

2. Close the oven and let it remain undisturbed. Take the first reading at least 1 hour after closing the oven.

3. Take as many readings as necessary to determine if the temperature range is within the specified tolerance. Three consecutive readings, taken no less than ½ hour apart, within tolerance allowed are adequate.

4. Adjust the temperature of the oven if an observed temperature reading is outside the tolerance specified. Allow at least ½ hour for the temperature to stabilize between each adjustment. Return to step 3.

Oven, Rolling Thin Film (cp-rtfo)

T240, D2872

Purpose To measure the critical components of a rolling thin-film oven.

Inspection Equipment Required

1. Ruler, readable to 1/8".
2. Timer, readable to 0.1 sec.

Tolerance The equipment must meet the tolerances specified in test methods T240 and D2872.

Procedure

1. Open the oven door. Measure and record the distance from the thermometer to the right side of the oven.
   Measure and record the distance from the thermometer bulb to the horizontal axis running through the center of the carriage.

2. Perform the test according to T240 or D2872. After placing the test samples in the oven, record the time needed for the oven to recover to test temperature.

3. Record the number of carriage rotations in one minute.

4. Record the oven temperature at half-hour intervals until the test is complete.

Penetrometer (cp-pa)
AASHTO T49, ASTM D5

Purpose To measure, inspect, and verify the accuracy of the equipment used to perform the penetration test.

Inspection Equipment Required

1. Balance, readable to 0.01 g.
2. Microscope or eyepiece, 10X
3. Metal Block, 10.0 mm high. Metal block, 25.4 mm high.
4. Support block, 3- 3.5" high.
5. Ruler, readable to 1 mm.
6. Calibrated Stopwatch, readable to 0.1 sec.

Tolerance The equipment must meet the tolerances specified in test methods T49 and D5.

Procedure

1. Remove the spindle, 50 g and 100 g weights from the penetrometer.
   Weigh and record the weight of each to the nearest 0.01 g.

2. Weigh each needle to the nearest 0.01 g.

3. Visually examine each needle with a microscope or eyepiece.
   Each needle should be straight and free of burrs.
   The base of each needle should be flat.

4. **If an automatic timing mechanism is used** on the penetrometer, start the calibrated stopwatch when the plunger is released and stop the calibrated stopwatch when the plunger stops.
   Record the time indicated on the calibrated stopwatch to the nearest 0.1 sec.

   If a manual device is used to release the plunger, check the accuracy of the timing device used over a 60 sec interval.
   Record the elapsed time to the nearest 0.1sec.

5. Place the support block on the base of the penetrometer.
   Place the 10 mm block on the support block.
   Adjust the needle height so that its tip just touches the top of the 10 mm block.
   Remove the 10 mm block and release the needle to the support block.
   Adjust the instrument to measure the distance moved.

   Repeat step 4 using the 25.4 mm block.
   Determine dial accuracy by comparing readings with the height of the blocks.

6. Measure and record the distance from the perforated shelf to the bottom of the water bath. Measure and record the distance from the perforated shelf to the surface of the water. Measure and record the distance the thermometer is immersed in the water.
7. Observe and record the temperature of the water in the bath to the nearest 0.05 C.

Pycnometers (cp-py)
T-228

Purpose To measure the volume and the physical dimensions of the pycnometer to verify they meet tolerances.

Inspection Equipment Required

1. 7" Calipers readable to 0.0001"
2. Balance capable of weighing 2000 g. readable to 0.01 g.

Tolerance Tolerances can be found in the test methods listed above.

Procedure

1. Use calipers to measure and record the diameter of the stopper.
2. Use calipers to measure and record the diameter of the hole in the stopper.
3. Observe if the top of the stopper is smooth and plane. Record findings.
4. Observe if the lower surface of the stopper is concave? Record findings.
5. Measure and record the height of the concave area.
6. Is the pyncnometer capable of holding 24 to 30 mls? Record weight.
7. Weigh the pyncnometer, record weight.
8. Calibrate the volume following the procedures in AASHTO T-228, section 6. Record results.

Rice Flasks (cp-rf)
T209

Purpose:

Inspection Equipment Required

1. Vacuum gage
2. Glass Disk
3. Astm #17F Thermometer
4. 12" Stir rod
5. Balance, capacity 5000g, readable to 0.1g

Procedure:

1. Record the dry weight of each clean, dry flask.
2. Record the weight of the glass plate to a tenth of a gram
3. Fill a 3000 ml beaker with distilled water and adjust the temperature to within 77± 1E F.
4. Fill a flask with water to the top of the bottle, use the stir rod to dislodge any air bubbles trapped in the flask.
5. Hold the glass plate partially over the mouth of the flask. Pour water into the flask while sliding the glass plate in place over the mouth of the flask. There should not be any air bubbles trapped under the glass plate.
6. Dry the whole assembly begin careful to prevent air from entering the flask.
7. Record the bottle number, weight of the flask, water, and glass plate.
8. Do steps 4 through step 7 for the remainder for the flasks.

Scales and Balances (cp-sb)
M231

Purpose To verify the accuracy of scales and balances

Inspection Equipment Required

Field standard weights that comply with NIST handbook 105-1(class F)

Procedure

1. Clean any foreign material (dust, aggregate, etc.), from the scale or balance. Level the scale or balance if necessary, and adjust to zero. For electronic scales and balances, a 20 minute warm-up period is required.

2. Apply to the center of scale or balance a load equal to 1/4 capacity of the scale or balance, or as near to 1/4 capacity as weights will allow. Record the value displayed. Remove the load and record the zero-load balance.

3. Apply to the center of scale or balance, a load equal to to ½ capacity, or as near to ½ capacity as weights will allow. Record the value displayed.
   Remove the load and record the zero-load balance.

4. Perform the shift test at ½ capacity. Place the weights on each quarter of scale or balance (front, back, and sides singly). Record the value displayed.
   Remove the load and record the zero-load balance.

5. Apply to the center of the scale or balance a load equal to 3/4 capacity , or as near to 3/4 capacity as weights will allow. Record the value displayed.
   Remove the load and the record zero-load balance.

6. Apply to the center of scale or balance a load equal to maximum capacity, or as near to maximum capacity as weights will allow. Record the value displayed.

7. Perform the decreasing-load test. Remove the load to ½ capacity. Record the value displayed. Remove the load and record the zero-balance.

8. Compare measured values to acceptable tolerances.

9. Remove from service any scales and balances which are not in compliance, and provide for necessary repairs or replacement.

Sieves

AASHTO M92, ASTM E11

Purpose To provide instructions for inspecting and measuring the physical condition of laboratory tests sieves ranging in size from 75 millimeters (3 inches) to 0.075 millimeters (No. 200).

Inspection Equipment Required

1. A caliper readable to 0.01 millimeter (used for No. 4 and coarser)

Tolerance

Sieves must meet the physical requirements specified in AASHTO M92 (ASTM E11)

Procedure

(Steps 1 and 2 apply only to sieves having openings greater than 4.75 millimeters)

1. Select an adequate number of individual sieve openings (3 or 4) along a 45E line. Measure and record the sieve openings to verify that the size opening indicated on the label is correct.

2. Repeat step 1, rotating the sieve 90E.

3. Inspect the general condition of the sieve. Check the frame and soldered joints for cracks or holes (check for pin holes in the finer sieves).

4. Make sure the sieve has an appropriate label.

5. Check for tightness of the wires on each individual sieve

Sieve - 325
ASTM 430

Purpose To determine the correction factor for the sieve used in determining the fineness of hydraulic cement or pozzolan.

Tolerance Sieves must meet the requirements as stated in ASTM 430

Equipment required

SRM sample
#20 sieve
#325 sieve
Analytical balance capable of weighing accurately of 0.0005 grams
water spray nozzle conforming to ASTM C430 section 3.2
pressure gauge conforming to ASTM C430 section 3.3
deionized water
desiccator

Procedure

1. Open an SRM sample
   Throw away 1/3 of the top sample
2. Sieve the remaining sample through a # 20 sieve
3. Isolate one sample weighing one gram. 1.0000. Put sample on the 325 sieve
4. Adjust the water pressure to read 10± 0.5 PSI
5. Wet sample on the sieve with approximately 50 ml of deionized water
   To wet sample, begin the water spray and place the sample under it with the bottom of the spray nozzle below the top of the sieve frame (cup) about 0.5 inches. Rotate cup one revaluation every second for 60 seconds.
7. Remove sample from the stream of water, and wash the sample with approximately 50 ml. Of deionized water. With a damp cloth, gently blot the underside of the screen to bring through the excess amount of water.
8. Place sieve with sample in an oven or on a hot plate heated to a temperature of 180 degrees Fahrenheit. Place the sample so there is ample room below it for the movement of air under the sieve. Too high a temperature will melt the solder holding the sieve in place and the sample will be lost.
9. Leave the sample in the oven to dry for a minimum of 45 minutes at 180E Fahrenheit or on the hot plate until the sample can move freely on the screen in all directions.
10. At the end of the drying, put the sample into a desiccator for one hour.
    Weigh the sample to the nearest 0.0005 grams.
11. Calculate sieve correction factor.

$$\text{Correction factor} = \frac{(\text{reported residue (g)} - \text{found resident (g)})}{\text{Found residue (g)}} \times 100$$

Correction factor is 10 ± from zero. If not in the range, recalibrate again and if it still falls outside the acceptable range, discard the sieve and replace it with a new one. Start the calibration process again with the new sieve.

12. Recalibrate the sieve after every fifth sample.

Cleaning the sieves.
Method 1:

Equipment required:

< Ultra sonic watch bath large enough to hold the container. Low powered 150 watts maximum power input
< Appropriate laboratory cleaning solution. Restricted to soap or detergent-type solutions. **Do not use diluted hydrochloric acid or acetic acid to clean or rinse the sieves.**

9. Place the sieve in the ultrasonic watch bath.
10. Turn on the bath and leave it on for a complete cleaning cycle which is up to 15 minutes long.
11. Remove the sieve and rinse with water to remove any remaining particles of lodged material.

Method 2:

Equipment needed

< 325 sieve
< Laboratory cleaning solution
< Hot plate
< Beaker or other container large enough to hold the sieve cup and cleaning solution

1. Heat the laboratory cleaning solution in the beaker over a hot plate to just below boiling.
2. Cover the container with a watch glass to reduce evaporation, and leave the screen in the solution until the particles are loosened from the screen.
3. Remove the screen and wash it with water.

Method 3:

Equipment needed

< 325 sieve
< Laboratory cleaning solution
< Beaker or other container large enough to hold the sieve cup and cleaning solution

1. Put the screen in a bath of cleaning solution and allow to remain in the solution overnight or for a period of at least 12 hours.
2. Rinse the sieve with water, and check to see that all particles of lodged material are removed in the rinse.
3. If particles remain in the sieve, clean the sieve again using a different cleaning method.

Slump Cones (cp-sc)

T119, C143

Purpose To measure the critical dimensions of slump cones.

Inspection Equipment Required

1. Caliper "A" capable of measuring the inside diameters of the mold. (Readable to 0.1 inch.)

2. Caliper "B" capable of measuring the thickness of the mold wall. (Readable to 0.001 inch.

3. Ruler readable to 1/16 inch.

Tolerance The tolerance must conform to figure 1 of C-143.

Procedure

1. With calipers, measure the inside diameters of the top (smaller) end twice at right angles to each other, and average the two readings.
   Record the results as the top diameter.
   Follow the same procedure for the base (larger) end, and record the results.

2. Place the slump cone base on a rigid flat surface and place a ruler down the axial center of the cone so that the ruler rests on the rigid surface. Place a straight edge horizontally across the top and measure the overall height of the slump cone.

3. At three random locations at the top of the cone, and at three random locations near the bottom of the cone, measure the thickness of the metal using calipers. Average of the six readings for the mean thickness.

Sodium Sulfate Containers, Sulfate Oven (cp-ssc)
T104/C88

Purpose To visually inspect sodium sulfate containers which are used to immerse the samples of aggregate in solution, and to measure the rate of evaporation for the sulfate oven.

Inspection Equipment Required

1 liter griffin low form beakers.

Tolerance Sulfate oven should be capable of being continuously heated, and the rate of evaporation should be to the tolerances specified in the test method.

Procedure **Sodium Sulfate Containers**

1. Visually inspect the sodium sulfate containers to determine if they will permit free access of the solution to the aggregate sample, and drainage of the solution from the sample without loss of aggregate.

Sulfate Oven

1. Determine the evaporation rate from the oven by measuring the loss of water from 1 liter griffin low form beaker placed at each corner and the center of each shelf of the oven. Each beaker should initially contain 500 grams of water, and the oven will be at a temperature of 70 ± 3EF throughout the test. The test should last five hours and beakers should be weighed before and after the test.

2. The evaporation requirement applies to all test locations when the oven is empty except for the beakers of water.

Soil Hydrometers (cp-sh)
AASHTO T88/D422

Purpose Verify critical dimensions of hydrometers.

Inspection Equipment Required

1. Calipers capable of measuring the diameter of the hydrometers readable to 0.001 inches.
2. Caliper or ruler capable of measuring length of hydrometer and scale length readable to .001 inches.

Tolerance

The critical dimensions of the hydrometers should meet the dimensional tolerances specified in ASTM E100.

Procedure

1. Measure and record overall length of hydrometer.
2. Measure and record the length of the hydrometer from the tip of the bulb to the 1.0 specific gravity marking or the 0 grams per liter marking.
3. Measure and record the length of the hydrometer scale.
4. Visually inspect the outer surface of the stem and body of the hydrometer to determine that they are symmetrical about a vertical axis. There should be no abrupt changes or constrictions that would hinder thorough cleaning or tend to trap air bubbles when the instrument is immersed.
5. Visual hydrometer should always float with its axis vertical.
6. The glass should be smooth and transparent and free of bubbles, dirt or other imperfections.
7. Ballast materials should be secure in the lower part of the body with no loose material of any sort inside the hydrometer.
8. The scale should be anchored to prevent it from moving. It should show no evidence of scorching.
9. Scale should be straight without twist.

Straight Edge

T99/D698, T180/D1557

Purpose To verify the compliance of straight edge.

Inspection Equipment Required

1. Certified flat surface.
2. 0.001" Feeler Gauges

Tolerance The equipment must meet the tolerances specified in test methods referenced above.

Procedure

1. By visual inspection, determine that the straight edge is made of hardened steel, is at least 10" in length, has one beveled edge, and has at least one longitudinal surface. It should be plane within 0.1% of length within the portion used for file trimming.

2. Measure and record any space between the straight edge and the flat surface. The straight edge should not be so flexible that trimming the soil surface with the cutting edge will cause a concave soil surface.

Thermometers, Liquid-in-Glass (cp-th)

Purpose To verify the accuracy of purchased general purpose thermometers in both Fahrenheit and Centigrade measurements.

Inspection Equipment Required

1. Circulating water bath
2. NBS certified thermometer

Tolerance

General purpose thermometer must maintain an accuracy of ± 0.5E C. (1E F.) unless otherwise stated.

Procedure

1. Bring the water bath to a constant temperature of 25E C. (77E F.)

2. Place thermometer in the bath.
   A. For total immersion, ensure that total immersion types are on a rack at a minimum clearance of 25 mm between the bottom of the rack and thermometers.
   B. For partial immersion, the depth of the partial immersion should be within 1 mm (1/32 inch) of the immersion line on the thermometer.

3. Allow a minimum of 5 minutes for thermometer to stabilize.

4. Establish the water bath temperature.

5. Remove one thermometer at a time and read to the nearest 0.1E C (1E F).

6. Etch the date inspected on all thermometers that fall within the ± 0.5E C. (1E F.) tolerance.

7. Return all thermometers which are not in compliance to the supplier for replacements.

Timers (cp-ti)

T72, T201, T202, ASTM D88, D2170, D2171

Purpose To measure and verify the accuracy of timing devices.

Inspection Equipment Required

1. Atomic Clock in Boulder, Colorado
2. Timer, readable to 0.1 second, having a verified accuracy with the tolerance listed in the above test methods.

Tolerance

Timers must meet the accuracy requirements specified in the applicable test methods listed above.

Procedure

A. Note requirement and verify

B. Call the Atomic Clock in Boulder, Colorado (303-499-7111). At the tone start timer and note the minute given verbally. Hang up the phone.

C. Let the timer run for at least 15 minutes.

D. Call the Atomic Clock again and stop the timer precisely at the minute tone. Again note the minute given.

E. Record time in minute elapsed between tones and the time elapsed on timer.

% accuracy= (A-B)/B *100
A= reading on lab timer (sec)
B= time between tones (sec)

Unit Weight Container - Concrete (cp-uwct)
T121, C138

Type of Equipment Unit Weight Container 1/4 cubic foot

Purpose To measure the volume of unit weight containers.

Inspection of Equipment

1. Thermometer - Capable of reading in 1E increments centigrade over a range of 0 - 50.
2. Scale or balance capable of measuring to the nearest .1 ls with an accuracy of + 1%.
3. Clear plastic plate ½" x 14" x 14" and plane to within .003/6".

Procedure

1. Bring all water and molds to a constant temperature of 22.7 C +/- 2 C.

2. Measure the weight or tare of the unit weight container and the plastic plate.

3. Fill the container with water at 22.7 C so that a dome is formed above the opening.

4. Place one edge of the plastic plate on one side of the unit weight container and lay the plate down on the unit weight pushing the air out to one side.

5. Ensure all the air has been evacuated and weigh the assembly. Use the following formula to calculate the volume of the vessel: B = C - A

   A Tare of bucket and plate
   B Weight of water only
   C Total weight filled with water

   Unit Weight = B(lbs.) / 62.4 (lbs./cf)

Unit Weight Measures - Aggregate (cp-uwa)

T19/C29

Purpose To calibrate unit weight measures.

Inspection Equipment Required

1. Plate glass 1/4 inch thick and at least 1 inch larger than the diameter of the measure.
2. Supply of water pump or chassis grease that can be placed on the rim of the container to prevent leakage.
3. Balance conforming to the requirements of AASHTO M231 for the class of general purpose.

Tolerance The equipment must meet the tolerance as specified in test method.

Procedure

1. Fill the container with water at room temperature so that a dome is formed above the opening. Place one edge of the plastic plate on one side of the measure and lay the plate down on the unit weight pushing the air out to one side.

2. Ensure that all the air is eliminated from the measure and determine the weight of water in the measure using the balance.

3. Measure the temperature of the water to determine the density and interpolate from table 3 in the specification.

4. Calculate the volume of the measure by dividing the weight of water required to fill the measure by its density.

Vacuum System (cp-vac)
T209

Purpose To measure vacuum pressure.

Inspection Equipment Required

1. Absolute pressure gauge.
2. Water vapor trap.
3. Hoses, connectors, tools, misc.

Tolerance Equipment must be capable of applying the vacuum specified in the applicable test method. (T209)

Procedure

1. Turn on the gauge 15 minutes before beginning the test.

2. Connect the gauge to the system with the trap in line between the system and the gauge, making sure all connections are air tight.

3. Open the number of lines normally used in testing.

4. Allow the readout of the gauge to stabilize.

5. Read and record the pressure indicated on the gauge.

Water Bath (cp-wb)

T-245

Purpose To verify that the operating temperature of the bath is accurate and consistent.

Inspection equipment Required

1. Calibrated ASTM 47F or 47 C thermometer, Serial #1137

Tolerance Tolerances can be found in the test methods in T245.

Procedure

1. Turn on the water bath and allow it to come to test temperature
2. Leave it on for a minimum of four hours
3. Record temperatures at half-hour intervals

Water Bath - Penetrometer (cp-wb)

T49

Purpose To verify that the operating temperature of the bath varies no more than 0.1EC.

Inspection equipment Required

1. NIST traceable thermometer

Tolerance Tolerances can be found in the test methods in T49.

Procedure

1. Turn on the water bath and allow it to come to test temperature
2. Leave it on for a minimum of four hours
3. Record temperatures at half-hour intervals

Weighing Devices Used in the Testing of Materials

AASHTO M 231-90

Purpose To verify the accuracy of weighing devices.

Tolerance Determined by type of balance.

Procedure As procedure directs for type of balance being calibrated. AASHTO M 231-90

Scope This specification covers requirements for scales and balances in the testing of construction materials, and the loose weights used with balances.

Calibration Record Forms
Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: Air Meter (cp-am)
Inspector:_____
Serial Number:_____
Location of Equipment: Central Materials Lab

Date of Calibration:_____
Calibration Interval: 12 months
Next Calibration Date:_____
Test Procedure: T-152, C-231
Calibration procedure: UDOT cp-am

Calibration Equipment Used: Threaded straight tubing, threaded bent tubing, and syringe.

Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

SITE	MEASUREMENTS	
A. Temperature Verification	Temperature setting/time:	Actual reading:
	_____	_____
	_____	_____
	_____	_____

GENERAL PROCEDURE

1. Fill the base with water.

2. Screw the short piece of straight tubing into the threaded petcock hole on the underside of the cover.
   Clamp cover on the base with the tube extending down into the water.

3. With both petcocks open, add water with a syringe through the petcock having the pipe extension below, until all air is forced out through the opposite petcock. Leave both petcocks open.

4. Pump up air pressure to a little beyond the predetermined initial pressure line. Wait a few seconds for compressed air to cool to normal temperature and then stabilize the gauge hand at the proper initial pressure line by pumping or bleeding off air as needed.

5. Close both petcocks and immediately press down on the thumb lever exhausting air into the base.
   Wait a few seconds until the hand is stabilized.
   If all the air was eliminated and the initial pressure line was correctly selected, the gauge should read 0%.
   If two or more tests show a consistent variation from 0% in the result, then change initial pressure line to compensate for the variation. Use the newly established "initial pressure" line for subsequent tests.

6. Screw curved tube into the outer end of petcock.
   Pressing on thumb lever and controlling flow with petcock lever, fill the 5% calibrating vessel (345 ml) level full of water from the base.

7. Release the air at the free petcock. Open the other petcock and let the water in the curved pipe run back into the base. There should be 5% air in the base.

8. With petcocks open, pump air pressure in exact manner as outlined in paragraph 4. Close petcocks and immediately press the thumb lever. Wait a few seconds for exhaust air to warm to normal temperature, and for the needle to stabilize. The dial should now read 5%.

9. If two or more consistent tests show that the gauge reads more or less than 5% air by .2% (or whatever is considered satisfactory), then remove gauge glass and reset the dial hand to 5% by turning the recalibrating screw located just below and to the right of the center diameter.

10. When gauge hand reads correctly at 5%, additional water may be withdrawn in same manner to check results at 10%, 15%, 20% ect.

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: Brass Rings and Assembly (cp-br) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Asphalt Laboratory **Test Procedure:** T53
Calibration procedure: UDOT cp-br

Calibration Equipment and serial number: Calipers readable to 0.01 mm
Balance 2000 g capacity readable to 0.01 g.

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Check Critical Dimensions

Shouldered Rings, Fig. 1 (A):

A. O.D. at top of shoulder	22.7- 23.3 mm	_____	_____	_____
B. I.D. at top of shoulder	19.5- 20.1 mm	_____	_____	_____
D. I.D. at bottom of ring	15.6- 16.2 mm	_____	_____	_____
G. Thickness of ring	6.0- 6.8 mm	_____	_____	_____

Ring Holder, Fig. 1 (B):

B. O.D. of ring area	23.4- 24.4 mm	_____	_____	_____
C. Total length of ring holder	75.7- 76.7 mm	_____	_____	_____
D. I.D. of small circles	5.1- 6.1 mm	_____	_____	_____

Ball Centering Guides, Fig. 1 (C):

D. O.D. of guide	24.3- 24.9 mm	_____	_____	_____

Steel Balls:

Diameter	9.5 mm	_____	_____	_____
Weight	3.45- 3.55 g	_____	_____	_____

Comments:_____
_____
_____

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: CBR (cp-cbr) Molds, Annular and Slotted Weights, Penetration Piston

Date calibrated:_____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Soils Laboratory **Test Procedure:** T-193
Calibration procedure: UDOT cp-cbr

Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____
Remarks:_____

Mold, Spacer, Tripod, Stem and Plate

Check and record dimensions shown on Figure 1.

Surcharge Weights:

Annular: Center Hole (54 mm) _____

Out Side Dia (149.2 mm) _____

Weight (2.27±0.04kg) _____

Slotted: Out Side Dia (149.2 mm) _____

Weight (2.27±0.04kg) _____

Penetration Piston:

Diameter (49.63±0.13mm) _____

Length (102+mm) _____

Comments:_____

_____

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: Compression or Loading Device (cp-ct)
Date Calibrated:_____ **Inspector:**_____
Calibration Interval: _____
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: **Calibration procedure:** UDOT cp-ct
Test Procedure: T193, T208, T216, T234, T236

Calibration Equipment Used:_____
_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Temperature: _____

Scale Readings: 1_____
2_____
3_____
4_____
5_____
6_____

Recorded Load	Instrument Reading	Machine error		Recorded Load	Instrument Reading	Machine error	
		Lbs.	Percent			Lbs.	Percent

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: Compressive Test Machine (cp-ct) **Date of Calibration:**_____
Inspector:_____ **Calibration Interval:** 12 months

Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Central Materials Lab **Test Procedure:** T-22-92, C-39-86
Calibration procedure: UDOT cp-ct
Calibration Equipment Used: Load Cells, Calipers, Straight Edge, Feeler Guage

Recommended: Repair_____ Replace_____ None_____ Other _____

Bearing Block Tolerance Check:	**Top Bottom**	**Bottom**	
	Planeness < 0.001"	**Thickness > 0.9"**	**Other Dimensions ok**

Remarks:_____

SITE **MEASUREMENTS**

A. Temperature Verification

	Temperature setting/time:	Actual reading:
	_____	_____
	_____	_____
	_____	_____

General Procedure

1. Apply a compressive axial load to molded cylinders or cores at a rate which is within a prescribed range until failure occurs.

   According to AASHTO T 67-85 Section: C. Verification by Elastic Calibration Device. Subsection: 13, 14 and 16-20.

Scope:

2. Elastic Calibration Device:
   A device for verifying the load readings of a testing machine which has:
   (a) elastic member(s) to which loads may be applied, combined with
   (b) mechanism or device for indicating the magnitude (or a quantity proportional to the magnitude) of deformation under load.

Comments: _____

_____

Form R-251

Rev. May 1995

Utah Department of Transportation

4501 South 2700 West, Salt Lake City, UT 84119

Materials Central Lab

Test Methods & Specifications
ASTM C-172, C-143, C-138,
C-173 or C-231, C-31, C-39

Specimen Size _____

Required 28 Day Strength _____

Concrete Compressive Strength Report

To _____ Project Engineer

Project Name & No. _____

Aggregate Source, Sand _____ Gravel _____

Air Entr. Agent _____

Concrete Class _____ Cement Source _____ Type Cement _____ Admixtures _____

Concrete Source _____ Bag Mix _____

Technician Name	Sample Number	Name of Client & Item Cast	Cast Date	Break Date	Age	Slump	% Air	Conc. Temp	Cross Sec.Dia	Total Load	Type of Fracture	PSI	Ave PSI

Org.	Acct.	Task.	CID

REMARKS: _____

_____

Materials Engineer_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Concrete Test Mold (cp-mcc) **Date of Calibration:**_____
Inspector:_____ **Calibration Interval:** each box before use
Lot Identification Number:_____ **Manufacturer:**_____
Location of Equipment: Certification Lab **Test Procedure:** ASTM C 470-94
Calibration procedure: UDOT CP-MCC

Calibration Equipment Used:_____
Recommended: Repair_____ Replace_____ Use_____ Other _____
Remarks: Plastic re-usable mold

Certification by lot from manufacturer:

1. Plastic mold material has max water absorption of 0.5% in 24 hr, per Test Method D570.
2. Plastic mold has Izod impact toughness of 117 J/m for a 3.2 mm thick specimen, per Test Method D256.
3. After being held at -12 deg C for 24 h, the plastic must not fracture when subject to tapping and jarring per Practice C31 and C192.

Lot Test - 3 randoms samples per shipment		**Limits**	**Pass**	**Fail**
Bottom fillet flush with sidewall?	Vert dist	3 mm		
(Tolerance = ± 1.6 mm)	Horiz dist	5 mm		
Resistance to damage under use (Note 1)				
Summary (Note 2)				

Notes:

1. Dry rodded coarse aggregate test 7.3.2, grading requirements C33, and penetration -compression testing C192.
2. Molds may be rejected for failure to comply with any provision above.

General Procedure

Molds must be constructed in the form of right circular cylinders which stand with the cylindrical axis vertical and the top open to receive the concrete. They should be made of materials that do not react with concrete containing portland or other hydraulic cements. They should be watertight and sufficiently strong and tough to permit their use without tearing, crushing, or deforming. AASHTO M-205-90 Section 6.

Fill mold with water to 90 or 95% full. Subject mold to tapping & jarring. Let stand 1 hour. Examine the mold for leaks (especially bottom hole for introducing air to remove concrete).

Examine the outside of the mold for curvature of the bottom. Any noticeable concave (inward curvature) or convex (outward curvature) is cause for rejection.

Comments:_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: **Conical Molds and Tamper (cp-cm)** **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 Months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Aggregate Lab **Test Procedure:** T-84
Calibration procedure: UDOT cp-cm

Calibration Equipment Used:_____
Action Recommended: Repair_____ Replace_____ None_____ Other _____
Remarks:_____

Cone:	
Inside Dia. Top of cone (40±3 mm) 0E 90E	
Inside Dia. Bottom of cone (90±3 mm) 0E 90E	
Depth of Cone (75±3 mm)	
Thickness of top of Cone (0.8 mm) 0E 90E	
Thickness of bottom of Cone (0.8 mm) 0E 90E	
Tamper:	
Diameter of Tamper Face (25±3 mm) 0E 90E	
Weight of Tamper (340±15 g)	

Comments:_____
_____
_____

Utah Department of Transportation

Materials Laboratory- Calibration Report

Apparatus: Direct Tension Machine Model (____) Date of Calibration:_____

Inspector:_____ Calibration Interval: 6 months

Serial Number: _____ Next Calibration Date: _____

Location of equipment: Asphalt Binder Laboratory Test Procedure: AASHTO T314
Calibration Procedure: **cp-ddt**
Calibration Equipment Used: Instron verification spring #_____, Calibrated ASTM Thermometer 62 C SN_____
Action Recommended: Repair_____ Replace _____ None _____ Other _____

Remarks: _____

Load cell calibrated in accordance with AASHTO T314: YES / NO

Verification of the elongation rate performed in conjunction with the load cell and displacement transducer verification : YES / NO

(1) Measurements made at -18/C? YES / NO

(2) Elongation plotted as a function of elapsed time ? YES / NO

(3) Resulting plot a straight line with a slope of 1.00 mm/min.? YES / NO

Instron Verification Specimen Serial #		Mean/CV	Verification Results	Difference	Tolerance
Load at Max Strain 1, N		Mean			+/- 1.0 N
		CV			< 1.0%
Modulus, Mpa		Mean			< 6 %
CV of the 20 sec loop		CV			< 6 %

Verification of the temperature detector performed daily by comparing the RTD output with a calibrated liquid-in-glass thermometer

(1) Calibrated at each temperature used? YES / NO

(2) Direct contact between RTD and temperature calibration device? YES / NO

(3) If not agreeing within " 0.1/C, correction applied or further calibration or maintenance performed? YES / NO

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: Dynamic Shear Rheometer (SHRP) (cp-dsr) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 6 Months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Asphalt Laboratory **Test Procedure:** T51
Calibration Procedure: cp-dsr
Calibration Equipment_____
Action Recommended: Repair_____ Replace_____ None_____ Other _____
Remarks:_____

1. Specimen Trimmer:

A. Straight Edge Width: Minimum 4 mm _____ mm.
B. Physical Inspection: Any rough edges ? Yes / No

11. Base Test Plates:

25 mm Plate:

A. Diameter 25 mm plate 25.00 ± 0.05 mm

1) mm	2) mm	3) mm	Average: mm

B. Height of Raised Portion 2.00 to 5.00 mm

1) mm	2) mm	3) mm	Average: mm

C: Physical Inspection
Scratches or Imperfections? Yes / No

8 mm plate:

A. Diameter 8 mm plate 8.00 ± 0.05 mm

1) mm	2) mm	3) mm	Average: mm

B. Height of Raised Portion 2.00 to 5.00 mm

1) mm	2) mm	3) mm	Average: mm

C. Physical Inspection
Scratches or Imperfections? Yes/ No

111. Spindles:

25 mm Spindle:

A. Diameter 25 mm plate 25.00 ± 0.05 mm

1) mm	2) mm	3) mm	Average: mm

B. Physical Inspection

Scratches or Imperfections? Yes/ No

8 mm Spindle:

A. Diameter 8 mm plate 8.00 ± 0.05 mm

1) mm	2) mm	3) mm	Average: mm

B. Physical Inspection

Scratches or Imperfections? Yes/ No

Gap:

A. Measure the gap between the base plate and spindle.

8 mm gap is.....2 mm ± 0.001 mm Yes/ No

25mm gap is.....1 mm ± 0.001 mm Yes/ No

1V. Thermistor: S/N_____

A. Thickness # 2.00 mm _____ mm.

B. Thermistor calibration (See attached worksheet)

C. Run Temperature Calibration for Software based on Calibrated Thermistor Yes/ No

D. Physical Inspection

Wafer surface not bent and wires OK ? Yes/ No

V. Verification of Overall Calibration:

A. Bohlin representative's yearly DSR/Torque check.
(See attached calibration report)

B. Utilizing a Cannon Viscosity Standard # _____ at;

Temperature, EC	Cannon Viscosity Standard mPa s (cP)	DSR Calculated Viscosity mPa s (cP)	DSR Tolerance ± 1% of Cannon Standard

Note: Conversion from Pascal to Centipoise:
(G*(Pascal)/Oscillating Frequency (radians/second)) X 1000

Comments:_____

_____

1V. Thermistor Calibration continued:

Thermistor Reading, EC	Certified Standard Reading, EC	Correction

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Ductility Apparatus (cp-da), molds **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number: 20457-16 **Next Calibration Date:**_____
Location of Equipment: Asphalt Laboratory **Test Procedure:** T51
Calibration procedure: UDOT cp-da

Calibration Equipment Used: Calipers readable to 0.0001"

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

SITE	SPECIFIED	MEASURED
A. Travel Speed	47.5 to 52.5 mm/min	_____
B. Functions without undue Vibration		_____
C. Space for at least 25 mm water above and below mold		_____
D. Physical Inspection		_____
E. Bath Temperature	4 plus or minus 0.05 C	_____
F. Depth of water in Bath	greater than 50 mm	_____
G. Thickness of mold	9.9 to 10.1 mm	_____
H. Width of mold at minimum cross section	9.9 to 10.1 mm	_____

Comments:_____
_____
_____

General Procedure

1. For each travel speed, begin with head at zero mark and note the time to travel each 10 mm increment for a total of 150 mm.
2. Calculate travel speed for each 10 mm increment. Determine average and compare with total travel speed for 150 mm. If the calculated average and total are within 0.50 mm per minute, record the total length and time data as travel speed to the nearest 0.1 mm/min.
3. Measure with a scale the depth and height of water above and below the mold.
4. Visually inspect machine for wear on any parts, loose bolts, leaks, etc....

5. Observe and record the temperature of the water in the bath
6. Measure and record the depth of water in the bath

Molds

7. Assemble a mold.
8. Measure and record the ID of the mold.
9. With the mold assembled, measure and record:
   - a distance between centers. (Fig 1, T51)_____
   - b total length of the mold _____
   - c distance between clips _____
   - d shoulder _____
   - e width at minimum cross-section _____
   - f width at the mouth of the clip _____
   - g thickness of the mold _____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Flash Cleveland Open-Cup (cp-fc) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 Months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Asphalt Laboratory **Test Procedure:** T48
Calibration procedure: UDOT cp-fc

Calibration Equipment Used: CALIPERS READABLE TO 0.01 mm SER #

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

_____

_____

	#	#	#
1. O.D. at the base of cup 67.5-69.0 mm	_____	_____	_____
2. I.D. at the base of cup 62.4-64.0 mm	_____	_____	_____
3. Thickness of bottom 2.8-3.6 mm	_____	_____	_____
4. From the top of cup to fill mark 9-10 mm	_____	_____	_____
5. O.D. of flange (J) 97-101 mm	_____	_____	_____
6. Total depth of cup 32.5-34 mm	_____	_____	_____

Comments: _____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Flash Point Tag Open-Cup (cp-fp) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Asphalt Laboratory **Test Procedure:** T79
Calibration procedure: UDOT cp-fp

Calibration Equipment Used: Calipers, readable to 0.0001" ser # _____
Balance , readable to 0.01g ser#

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks: _____

_____

_____

	# 1	# 2	# 3
1. Height of cup 50.0- 53.2 mm	_____	_____	_____
2. Rim to top of cup 7.1-8.7 mm	_____	_____	_____
3. Diameter under the ridge 53.1-56.9 mm	_____	_____	_____
4. Diameter before curvature 49.2-52.4	_____	_____	_____
5. Inside depth of cup 47.6 mm	_____	_____	_____
6. Weight of cup is not more than 95 g	_____	_____	_____

Comments: _____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Flow Gauges (cp-fg) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment:_____ **Test Procedure:** T170, T240
Calibration procedure: UDOT cp-fp

Calibration Equipment Used: Timing device, ser # _____
ASTM 17C or 17F Thermometer, Ser # _____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

		#1	# 2 #3
1.	Total volume of water at 25 ± 1 E C in the filled flask.	_____	_____
2.	Time required to evacuate water.	_____	_____
3.	Flow rate = Volume m./Time, min.	_____	_____
4.	Plot actual flow versus the gauge reading.		
5.	Reading from plot for desired flow:		_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Kinematic Viscometers

Apparatus: Zeitfuchs Cross- Arm **Date of Calibration:** _____

Inspector:_____ **Calibration Interval:** 36 months

Serial Number:_____ **Next Calibration Date:**_____

Location of Equipment: Asphalt Laboratory **Test Procedure:** T201, A3

Use Calibration Form: UDOT cp-vb

Calibration Equipment Used: Viscosity Standards
Calibrated Thermometer
Calibrated Timer

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

_____

_____

_____

MEASURED

A. Efflux time (t) _____

B. Viscosity of Standard (v) _____

Use formula C= v/t _____

C. Constant C _____

Comments:_____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: LA Abrasion Machine (cp-la) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 24 Months
Make: Soiltest **Model:**_____ **Serial Number:** UDOT 59-44-78
Next Calibration Date:_____ **Test Procedure:** AASHTO T-96
Location of Equipment: Aggregate Lab. **Calibration Procedure:** UDOT CP-LA
Calibration Equipment Used:_____

Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks: _____

_____

Inside Diameter(711+\-5mm)	
Inside Length(508+\-5mm)	
Opening Dimensions	
Axis Horizonal(within 1 in 100 slope)	
Removable steel shelf full length projecting inward(89+\-2mm)	
Shelf thickness (mm)	
Shelf position at least greater than 1.27m from opening on outside diameter of cylinder in direction of rotation	
Shelf not bent	
Check for backlash or slip in driving mechanism	
Charge (steel balls all weigh between 390 and 445g) Record weights (to nearest g)	
1	
2	
3	
4	
5	
6	
7	

8	
9	
10	
11	
Total	
Determine rpm of drum (30 to 33)	
Check that counter correctly counts to 500	

Comments:_____

_____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Liquid Limit Device and Grooving Tool (cp-llg)

Date of Calibration: _____

Inspector:_____ **Calibration Interval:** 12 months

Serial Number:_____ **Next Calibration Date:**_____

Location of Equipment: Geotechnical Lab **Test Procedure:** T-89

Calibration procedure: UDOT cp-llg

Calibration Equipment Used: Calipers readable to 0.001 in.

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks: _____

_____

Measure dimensions of the liquid limit device and grooving tools and record on attached Figure 1	
Rate of shocks (should be about 2 per second)	
Does pin connecting cup permit excessive side play?	
Screws connecting cup to hanger are tight?	
Point of contact on cup and base excessively worn? (see Note 1)	
Lip of cup excessively worn? (see Note 1)	
Excessive groove worn in cup? (see Note 1)	
Is device in good working order?	

Note 1: Wear is considered excessive when

1) the point of contact on the cup or base exceeds approximately 13 mm (0.5 in.) in diameter, or
2) when any point on the rim of the cup is worn to approximately ½ the original thickness.

Although a slight groove in the center of the cup is noticeable , it is not objectionable.

If the groove becomes pronounced before other signs of wear appear, the cup should be considered excessively worn, and should be replaced.

Liquid Limit Device and Grooving Tool (cp-llg) Page 2

A base which is excessively worn may be refinished as long as

1) the thickness does not exceed the tolerance shown in Figure 1 by more than -2.5 mm (-0.1 in.)
2) the distance between the cup at the cam follower and the base is maintained within the

tolerances specified in Figure 1.

Gage End	10±.2mm			
Cutting Edge	2.0±.1mm			
Width	13.5±.1mm			
Depth of Groove	10±.2mm			

Comments: _____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Manual Compaction Hammer (cp-mh) **Date of Calibration**: _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Geotechnical Lab **Test Procedure:** T-99 and T-180
Calibration procedure: UDOT cp-mh

Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Rammer Fall Height (304.8 ±1.524 mm)	
Rammer Fall Height (457.2 ±1.525 mm)	
Rammer Circular Face Diameter (50.8 ± 0.254 mm): 0 degrees 90 degrees	
If not circular, area of face (2006 to 2047 mm^2)	
Weight of Hammer (2.495 ± 0.009 kg)	
Weight of Hammer (4.536 ± 0.009 kg)	
4 Vent Holes (9.5+ mm)	

Comments: _____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Marshall Hammer (cp-marh)
Inspector:_____
Serial Number: N/A
Manufacturer: Humboldt
Location of Equipment:_____

Date of Calibration: _____
Calibration Interval: 12 months
Next Calibration Date:_____
Model: N/A
Test Procedure: AASHTO T-245
Calibration procedure: UDOT cp-marh

Calibration Equipment Used: Balance readable to 0.1g
Tape measure or 18" straight edge readable to 1/16" Calipers readable to .0001"

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

_____

AASHTO SPEC.	98.4mm	4527g. - 4545.0g	18 inches
Hammer I.D.	Dia. of face	Sliding Weight	Free fall

Is correlation with a manual hammer within .5 lbs.?_____

Is correlation done yearly? _____

Procedure:

1. Dismantle the sliding weight. Weigh and record the weight.
2. Re-assemble the sliding weight and measure the distance from the bottom of the handle to the top of the weight. Record this distance.
3. With calipers, measure and record the diameter of the compaction face.
4. Correlation between the manual and mechanical hammers is done every 12 months. The difference between the two hammers should not exceed 0.5 lbs.

Comments:_____

_____

Utah Department of Transportation
Materials Laboratory - Calibration Report

Marshall Mechanical Compactor (cp-mmc) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 36 months
Serial Number: N/A **Next Calibration Date:**_____
Manufacturer: Humboldt **Model:** H-1356
Location of Equipment: Bituminous Lab **Test Procedure:** UDOT cp-mmc

Calibration Equipment Used: Hand operated hammer, mechanical operated hammer

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Mechanical bulk density: _____ **Hand bulk density:** _____

Procedure:

1. Use the same aggregate, asphalt percentage, temperatures, and the amount of blows for steps two and three.

2. Compact marshall specimens with mechanical compactor and record the data.

3. Compact marshall specimens with a hand compactor and record the data.

Comments: _____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Marshall Molds & Breaking Head (cp-mmbh) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number: N/A **Next Calibration Date:**_____
Manufacturer: Humboldt **Model:** H-1342
Location of Equipment: Bituminous Lab **Test Procedure**: AASHTO T-245
Calibration procedure: UDOT cp-mmbh

Calibration Equipment Used: 1) 6" calipers capable of measuring an inside diameter of 4" and readable to 0.0001",
2) template with a radius of 2" inner curvature

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Diameter specification 3.995" to 4.005"

Top of mold	Bottom of mold
1._____2._____	1._____2._____
1._____2._____	1._____2._____
1._____2._____	1._____2._____
1._____2._____	1._____2._____
1._____2._____	1._____2._____
1._____2._____	1._____2._____
1._____2._____	1._____2._____
1._____2._____	1._____2._____
1._____2._____	1._____2._____

Any gaps between template and breaking head? _____
Does the breaking head assembly bind? _____

Procedure:

1. Measure and record the inside diameter of the mold to the nearest 0.0001".
2. Rotate the mold 90 degrees. Measure and record the results again.
2. Place the template into each half of the breaking head.
3. Observe any gaps, record findings.

Comments:_____
_____
_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Marshall Stability & Flow Test Apparatus (cp-mt) **Date of Calibration**: _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number: St#44-1037 **Next Calibration Date:**_____
Manufacturer: Humboldt **Model:** H-1339
Location of Equipment: Bituminous Lab **Test Procedure:** AASHTO T-245
Calibration procedure: UDOT cp-mt

Calibration Equipment Used: Stopwatch
Measuring tape or 12" ruler
Load cell with a sensitivity of 10 lbf up to 1000 lbf (44.5 N to 4.45 kN) & from 1000 to 5000 lbf (4.45 kN to 22.2 kN) sensitivity.

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks: _____

_____

Distance moved: _____ Time: 1 minute

Rate of movement: _____(AASHTO standard - 2in/min or 50.8 mm/min)

Load at 1,000 lbf: _____ **Load at 5,000 lbf:** _____

Procedure:

1. Use the ruler to measure the vertical movement of loading jack and horizontal movement on the instrument graph within 30 seconds after starting the timer.

   Use the stopwatch to time the amount of movement of the test head on the loading jack. It must move 2 inches in 60 seconds.

2. Use the load cell to measure the pounds of force applied.

   Compare readings of the load cell to the rate of movement shown on the instrument graph to verify the accuracy of pounds reading on the graph.

Comments: _____
_____
_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Mechanical Compactor (cp-mc) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment:_____ **Test Procedure:** T99/D698, T180/D1557
Calibration procedure: UDOT cp-mc

Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

_____

_____

Rammer Fall Height (304.8 ±1.524 mm) _____

Rammer Fall Height (457.2 ±1.525 mm) _____

Rammer Circular Face Diameter (50.8 ± 0.254 mm) _____
0 degrees
90 degrees
If not circular, area of face (2006 to 2047 mm^2) _____

Weight of Hammer (2.495 ± 0.009 kg) _____

Weight of Hammer (4.536 ± 0.009 kg) _____

Comments: _____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: **Mechanical Shaker (cp-ms)** **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:**_____
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment:_____ **Test Procedure:**_____
Calibration procedure: UDOT cp-ms

Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

_____

_____

Sieve Size	Sieve Weight (g)	Sieve+Soil Weight After Mechanical Shaking (g)	Sieve+Soil Weight (g) After Hand Shaking 1 Min.	Percent Loss During Shaking

Comments:_____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Moist Cabinet, Room (cp-mcr) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Central Materials Lab **Test Procedure:** C-511-93

Calibration Equipment Used: Calibrated thermometer and humidity measuring device.

_____

Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

A. Temperature Verification Temperature setting/time: Actual reading:

_____ _____
_____ _____
_____ _____

Moist Cabinets - General

- Maintain the atmosphere in a moist cabinet at a temperature of 73.4 ± 3EF and a relative humidity of at least 95% at all times.
- Equip all storage units with wet and dry recording thermometers.
- Shelves on which fresh specimens are placed should be level.
- Provide cabinets which are constructed of durable materials with tightly fitting doors.
- Maintain the specified relative humidity with one or more fog sprays, water sprays, or curtains of water on the inner walls that are directed so that the water will collect in a pool at or near the bottom of the moist storage section.
- Provide automatic control of air temperature where a cabinet is located in a non air-conditioned work room, or where maintaining temperatures within the specified range is difficult.

Moist Cabinets - Monitoring Temperature and Humidity

- Take periodic readings from the wet and dry thermometers each day with a minimum of once a day.
- Record each reading and the time the reading is taken.
- Determine that the readings are within the specified temperature and humidity range.
- If the readings fall outside the acceptable range, adjust the mechanisms on the cabinet to bring the readings into the appropriate range.
- Avoid taking humidity readings when saturation is typically below optimum, such as directly after specimens are placed in or removed from the storage unit.

Moist Room - General

- Maintain the ambient air in a moist room at a minimum temperature of 68E F and a maximum temperature of 82.5EF, and a humidity of at least 50% at all times.

Comments:_____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Mold -soils testing, compaction (cp-m) **Date of Calibration:** _____ **Inspector:** _____
Calibration Interval: 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Geotechnical Lab **T e s t**
Procedure: T-99, T-180, T-193
Calibration procedure: UDOT cp-m
Calibration Equipment Used:_____
Action Recommended: Repair_____ Replace_____ None_____ Other _____
Remarks:_____

Dimension Measured	Measurement
Inside Diameter 4 inch mold (4+\-0.016 in)	
	At 90 degrees
Invert 4 inch mold diameter	
	At 90 degrees
Height of 4 inch mold (4.584+\-0.005 in)	
	At 90 degrees
Volume of 4 inch mold (0.0333+\-0.0003 cu ft)	
Inside Diameter 6 inch mold (6+\-0.026 in)	
	At 90 degrees
Invert 6 inch mold diameter	
	At 90 degrees
Height of 6 inch mold (4.584+\-0.005 in)	
	At 90 degrees
Volume of 6 inch mold (0.075+\-0.00075 cu ft)	

Comments:_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Oven, General Purpose (cp-gpoven) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 4 Months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment:_____ **Calibration procedure:** UDOT cp-gpoven

Calibration Equipment Used: Calibrated Thermometer, 1E increments, Ser # _____
Clothes pin
Brass thermometer well

Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____
_____

Site Measurements

A. Temperature Verification

Temperature setting/time:	Actual reading:
_____	_____
_____	_____
_____	_____

General Procedure

1. Place the thermometer inside the brass well with the clothes pin attached to the thermometer. Position the thermometer on the shelf where the samples are normally placed.
2. Close the oven and let it remain undisturbed. Take the first reading at least 1 hour after closing the oven.
3. Take as many readings as necessary to determine if the temperature range is within the specified tolerance. Three consecutive readings, taken no less than ½ hour apart, within tolerance allowed, are adequate.
4. Adjust the temperature of the oven if an observed temperature reading is outside the tolerance specified. Allow at least ½ hour for the temperature to stabilize between each adjustment. Return to step three.

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Oven, Rolling Thin Film (cp-rtfo) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Asphalt Laboratory **Test Procedure:** T240
Calibration procedure: UDOT cp-rtfo
Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

SITE	SPECIFIED	MEASURED
A. **Thermometer placement**	50.8 plus or minus	_____
Vertical	3.2 mm	_____
B. **Thermometer placement**	25 mm	_____
C. **Test temperature recovery**	10 minutes max.	_____
D. **Carriage rotation**	15 plus or minus	_____
	0.2 R/min	_____
E. **Oven temperatures**	163 plus or minus	_____
	0.5 C	_____

Procedure

1. Open the oven door. Measure and record the distance from the thermometer to the right side of the oven. Measure and record the distance from the thermometer bulb to the horizontal axis running through the center of the carriage.
2. Perform the test according to T240 or D2872. After placing the test samples in the oven, record the time needed for the oven to recover to test temperature.
3. Record the number of carriage rotations in one minute.
4. Record the oven temperature at half-hour intervals until the test is complete.

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Penetrometer (cp-pa) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 6 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Asphalt Laboratory **Test Procedure:** T49
Calibration procedure: UDOT cp-pa

Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

	SITE	SPECIFIED	MEASURED
A.	50 g weight	50.0 plus or minus 0.05 g	_____
	100 g weight	100.0 plus or minus 0.05 g	_____
	needle and spindle	47.5 plus or minus 0.05 g	_____
B.	Needle weight		_____
C.	Physical inspection of needle		_____
D.	Timing mechanism		_____
E.	Dial accuracy		_____
F.	Dist. perforated shelf to bottom of water bath greater than 50 mm		_____
	Dist. perforated shelf to water surface greater than 100 mm		_____
	Dist. thermometer immersed in water 150 plus or minus 15 mm		_____
G.	Water bath temperature		_____

Comments:_____

_____

_____

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: Pycnometers (cp-py)
Inspector:_____
Serial Number:_____
Location of Equipment: Asphalt Laboratory

Date of Calibration: _____
Calibration Interval: 12 months
Next Calibration Date:_____
Test Procedure: T-228
Calibration procedure: UDOT cp-py

Calibration Equipment Used: Calipers, Ser# _____

Balance readable to 0.01 g Ser #_____

Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

_____

_____

Identification marking	#	#	#
1. Diameter of the stopper 22-26 mm			
2. Diameter of the hole in stopper 1.0-2.0mm			
3. Is top of stopper smooth and plane?			
4. Is lower surface of stopper concave?			
5. Depth of concave 4-18 mm high at center?			
6. Capacity of pycnometer 24-30 ml?			
7. Weight of pycnometer 40 grams or less?			
8. Mass of pycnometer and water			

Comments: _____
_____
_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: **Rice Flasks (cp-rf)**
Inspector:_____
Serial Number: N/A
Manufacturer: Various
Location of Equipment: Bituminous lab

Date of Calibration: _____
Calibration Interval: 12 months
Next Calibration Date:_____
Model:_____
Test Procedure: AASHTO T-209
Calibration procedure: UDOT cp-rf

Calibration Equipment Used: Vacuum gage, Glass disk, Astm #17F Thermometer, 12" Stir rod, Balance capacity 5000g, readable to 0.1g

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks: _____

20 inches of mercury minimum? _____
#200 screen on ends of stoppers? _____
Gauge placed at end of system? _____

Flask I.D. Dry weight of flask Flask filled with water and glass plate

_____
_____
_____
_____
_____

Weight of glass plate _____

GENERAL PROCEDURE

1. Record the dry weight of each clean, dry flask.
2. Record the weight of the glass plate to a tenth of a gram
3. Fill a 3000 ml beaker with distilled water and adjust the temperature to within 77± 1E F.
4. Fill a flask with water to the top of the bottle, use the stir rod to dislodge any air bubbles trapped in the flask.
5. Hold the glass plate partially over the mouth of the flask. Pour water into the flask while sliding the glass plate in place over the mouth of the flask. There should not be any air bubbles trapped under the glass plate.
6. Dry the whole assembly begin careful to prevent air from entering the flask.
7. Record the bottle number, weight of the flask, water, and glass plate.
8. Do steps 4 through step 7 for the remainder for the flasks.

Comments:_____
_____
_____
_____

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: Sand Equivalent Equipment **Date of Calibration:** _____
Inspector:_____ **Calibration Interval**: 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Aggregate Lab. **Test Procedure:** T-176 (Standard)
Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks: _____
_____

Graduated Plastic Cylinder, rubber stopper, irrigator tube, weighted foot assembly and syphon assembly	Measure and record dimensions shown on attached Figure 1, show measurements on Figure 1.
1 gallon bottle of working calcium chloride solution height above working surface? (36 in. +\- 1 in.)	shelf
3 oz. tin box: Diameter (2.25 in.) Capacity (85 +\- 5 ml)	
4 in. wide mouth funnel	
Timer: a b (a-b)/b*100	
Mechanical Shaker (Soil Test-232, No. 144): Throw 8+\-0.4 in. Cycles per minute (175+\-2)	
Mechanical Kelvinator Thermo-Resistive Unit: Measure mho's in degrees Kelvin	

Comments:_____
_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Saybolt Viscometer
Inspector:_____
Serial Number:_____
Location of Equipment: Asphalt Laboratory

Date of Calibration: _____
Calibration Interval: 36 Months
Next Calibration Date:_____
Test Procedure: T72, section 9
Use Calibration form for UDOT cp-vb

Calibration Equipment Used: Calibrated Thermometer
Viscosity Standard
Calibrated Timer

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

SITE	SPECIFIED	MEASURED OR CERTIFIED
A. Laboratory Temperature	20-30E C	_____
B. Viscosity Bath Temperature	50.0E C	_____
C. Viscosity of Standard (V)	> 90 sec	_____
D. Efflux time (t)		_____

E. Does efflux time of Viscosity Standard differ from Certified

Saybolt viscosity value by more than 0.2 percent? yes____ no____

F. If yes, Calculate a correction factor , (F) using F=V/t _____

Note: Do not use viscometers or orifices in referee testing if they require corrections greater that 1.0 percent.

Comments:_____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: **Scales and Balances (cp-sb)** **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:**_____
Serial Number:_____ **Next Calibration Date:**_____
Manufacturer:_____ **Model:**_____
Location of Equipment:_____ **Calibration Procedure:** UDOT cp-sb
Standard/Weights Identification:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

_____

SCALE AND BALANCE WORKSHEET

Scale Capacity:_____ Acceptance Tolerance:_____

Value of Scale Division:_____ Maintenance Tolerance:_____

	Measured Load	Zero Load Value	Tolerance	Balance
Increasing - Load Test:				
1/4 Capacity				
½ Capacity				
Shift Test				
3/4 Capacity				
Full Capacity				
Decreasing - Load Test				
Zero - Load Balance				

Within Tolerance:_____ **Out of Tolerance**:_____

Comments: _____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Sample Printout of Results

Apparatus: **Sieves** AASHTO M-92/ASTM E-11/Utah UDOT (Std. Spec. for Wire Cloth Sieves)
Project: R4 Main-Rich 81MATRL4/SFD/4266/8732/6219
Feature: 12 new full/ Warehouse) to Larry Gay 896-13-61337KED
Manufacturer: W.S. Tyler/USA No. 99759825
Sieve Size: 2.360 (No. 8) Sieve No. 002789.Z#
By: JAL (UDOT) Date: 9-9-97

	Aperture Dimensions		**Wire Diameter Readings**	
No.	**Shoot (mm)**	**Warp (mm)**	**Shoot (mm)**	**Warp (mm)**
1	2.35800	2.35700	1.06700	.99000
2	2.32700	2.31800	1.07100	1.00600
3	2.34300	2.39400	1.05400	.99900
4	2.28500	2.39400	1.04900	.99200
5	2.35900	2.38800	1.03500	.99400
6	2.32500	2.38300	1.05700	.99800
7	2.34900	2.29900	1.05000	1.00100
8	2.34900	2.41700	1.06400	.99200
9	2.35800	2.38600	1.06300	.99300
10	2.34300	2.34700	1.05500	.99000
11	2.31800	2.39400	1.05100	1.00300
12	2.38500	2.33200	1.05900	1.00600
13	2.33600	2.39000	1.04800	.99700
14	2.35400	2.38100	1.04600	.98700
15	2.35200	2.40500	1.05600	.99100
16	2.33400	2.34100	1.06300	.99600
17	2.33100	2.41800	1.05600	1.00100
18	2.36500	2.31200	1.05700	.99700
19	2.35900	2.40600	1.05500	1.00300
20	2.30700	2.26400	1.04500	1.00500
Statistical Calculations				
Mean	2.34685	2.36710	1.05495	.99705
Std Dev .02017	.04366	.00827	.00583	
Cond Limit	2.28000	2.44000	1.15000	.85000
Req. #reading	1	6	0	0

Aperture Calculations

Average actual shoot aperture (limits are 2.280 to 2.440mm)	=	2.35675
Average actual warp aperture (limits are 2,280 to 2,440mm)	=	2.36710
Percent aperture greater than 2,525 mm (limit 5% max.)	=	0.00000
Largest actual aperture (limit = 2.600 mm)	=	2.41800

Wire Diameter Calculations

Average actual diameter shoot (limits are 0.850 to 1.150mm)	=	1.05495
Average actual diameter warp (limts are 0.850 to 1.150mm)	=	.99705

Visual Check OK **Specification check** OK

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: **Sieve 325 (cp-sv325))**
Inspector: R. Zimmerman
Serial Number:_____
Manufacturer:_____
Location of Equipment:_____

Date of Calibration: _____
Calibration Interval:_____
Next Calibration Date:_____
Model:_____
Test Procedure: ASTM 430
Calibration Procedure: UDOT cp-sv325

Equipment required:
SRM sample, #20 sieve, #325 sieve.
Analytical balance capable of weighing accurately of 0.0005 grams.
Water spray nozzle conforming to ASTM C320 section 3.2.
Pressure gauge conforming to ASTM C430 section 3.3.
Dionized water, desiccator.

Sample test data from logbook pages maintained in the Cement Lab.

Cup #		***Factor***
1	.0830-.0808 = .0022 (.0022÷.080)(100) =	2.7228
2	.0830-.0794 = .0036 (.0036÷.0794)(100)=	4.5340
3	.0830-.0848 = -.0018 (-.0018÷.0848)(100)=	-.2.1226
4	.0830-.0832 = -.0002 (-.0002÷.0832)(100)=	-0.2404
5	.0830-.0846 = 0.0015 (-.0015÷.0846)(100)=	-1.7730

Sample #	**Cup #**	**D**	**C**	**Used**	**% Return**	**Run Date**
F-1	1	.1856	2.7228	1/	19.1	1.16.97
F-2	2	.2302	4.5340	1/	24.1	1.16.97
F-3	3	.1992	-2.1226	1/	19.5	1.16.97
F-4	4	.1829	-0.2404	1/	18.2	1.16.97
F-5	5	.1706	-1.7730	1/	16.8	1.16.97
Fed 123	1	.0523	2.7228	2/	94.6278 Passing 94.63	1.31.97
Fed 124	2	.0422	4.5340	2/	95.5364 Passing 95.54	1.31.97
97-R4-M-0021		.1983	2.7228	2/	20.3	3.12.97
F-1	1	.1784	2.7228	3/	18.3	5-5-97

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: **Slump Cone (cp-sc)** **Date of Calibration:** _____

Inspector:_____ **Calibration Interval:** 12 months
Serial Number: H-3640 **Next Calibration Date:**_____
Location of Equipment: Central Materials Lab **Test Procedure:** T-119, C-143
Calibration Procedure: UDOT cp-sc

Calibration Equipment Used: Caliper A readable to 0.1 inch (diameters)
Caliper B readable to 0.0001 inch. (wall thickness)
Ruler readable to 1/16 inch.

Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

	Base Diameter 8 ± 1/8 ”	**Wall Thickness** 0.045 ” Minimum **Top**	**Bottom**
	_____	_____	_____
	_____	_____	_____
Average	_____	_____	_____

	Top Diameter 4 ± 1/8 ”	**Height of Mold** 12 ± 1/8 ”
	_____	_____
	_____	
Average	_____	

Comments: _____
_____
_____

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: Sodium Sulfate Containers (cp-ssc), Sulfate Oven
Date of Calibration: _____ **Calibration procedure:** cp-ssc
Inspector:_____ **Calibration Interval:** 12 Months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Aggregate Lab. **Test Procedure:** T-104
Calibration Procedure: UDOT cp-ssc
Calibration Equipment Used:_____
Action Recommended: Repair_____ Replace_____ None_____ Other _____

Beaker #	#1	#2	#3	#4	#5
Tare & H_2O					
Tare					
Wt H_2O	500.0	500.0	500.0	500.0	500.0

Time_____

Tare & H_2O					
Tare					
Wt H_2O					

Time_____

Initial Wt. H_2O	500.0	500.0	500.0	500.0	500.0
Final Wt. H_2O					
Wt loss					

Wt loss					
Initial Wt. H_2O	500.0	500.0	500.0	500.0	500.0

Percent Loss					

A minimum of 20% loss is required **Oven Temp.**_____(70±3F)____
Sodium Sulfate Containers adequate to permit free access of the solution to the aggregate sample and drainage of the solution for the sample without loss of aggregate? _____
Comments:_____
_____

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: Soil Hydrometer (cp-sh) **Date of Calibration**: _____
Inspector:_____ **Calibration Interval:** 24 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Soils Laboratory **Test Procedure:** T-88
Calibration procedure: cp-sh

Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

_____

Length of Hydrometer (278 to 280 mm)	
Length for tip to 1.0 sp.g. or 0 g/l marking (244 to 246 mm)	
Length of scale (82 to 84 mm)	
Symmetrical about vertical axis?	
Abrupt changes/constructions that could trap air bubbles?	
Floats with axis vertical?	
Glass smooth, transparent and free of bubbles and imperfections?	
Ballast material secure? Any loose material in hydrometer?	
Scale anchored without twist and not scorched?	

Comments: _____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Straight Edge (cp-se)
Inspector:
Serial Number:_____
Location of Equipment: Soils Laboratory

Date of Calibration: _____
Calibration Interval: 6 months
Next Calibration Date:_____
Test Procedure: T99, T180
Calibration procedure: cp-se

Calibration Equipment Used: Certified flat surface
0.001" Feeler Gauges

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Straight Edge OK _____ YES _____ NO

Inspection procedure:

1. By visual inspection, determine that the straight edge is made of hardened steel, is at least 10" in length, has one beveled edge, and has at least one longitudinal surface. It should be plane within 0.1% of length within the portion used for file trimming.

2. Measure and record any space between the straight edge and the flat surface. The straight edge should not be so flexible that trimming the soil surface with the cutting edge will cause a concave soil surface.

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Thermometers (cp-th)
Inspector:_____
Serial Number:_____
Location of Equipment:_____

Date of Calibration: _____
Calibration Interval: 6 months
Next Calibration Date:_____
Test Procedure: T201,T202,T228,T49,T51
Calibration procedure: cp-th

Calibration Equipment Used **Serial Number:**

_____ _____
_____ _____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Laboratory		Therm.type,ser#		Reading at 25EC (77EF)		True temp.	Correction	Remarks
						25.0 (77)		
						25.0 (77)		
						25.0 (77)		
						25.0 (77)		
						25.0 (77)		
						25.0 (77)		
						25.0 (77)		
						25.0 (77)		
						25.0 (77)		
						25.0 (77)		
						25.0 (77)		
						25.0 (77)		

If + add corrections to thermometer to get true temperature.

If - subtract correction from thermometer to get true temperature.

Laboratory	Therm type. ser.#	Reading @50 C	True temp.	Correction	Remarks
			50.0 C (122F)		
			50.0 C (122F)		
			50.0 C (122F)		

Laboratory	Therm type. ser.#	Reading @60 C	True temp.	Correction	Remarks
			60.0 C (140F)		
			60.0 C (140F)		
			60.0 C (140F)		
			60.0 C (140F)		
			60.0 C (140F)		
			60.0 C (140F)		
			60.0 C (140F)		
			60.0 C (140F)		

Laboratory	Therm type. Ser#	Reading @163 C	True temp.	Correction	Remarks
			163.0 C (325F)		
			163.0 C (325F)		
			163.0 C (325F)		
			163.0 C (325F)		
			163.0 C (325F)		

If + add corrections to thermometer to get true temperature.

If - subtract correction from thermometer reading to get true temperature.

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Thermometer, Liquid-in-Glass (cp-th) Date of Calibration: _____
Inspector:_____ **Calibration Interval:** 6 months
Serial Number:_____ **Next Calibration Date:**_____
Calibration Procedure: UDOT cp-th
Range:_____ F or C in_____Division **Mark:**_____ ASTM_____
Immersion: _____ **Location of Equipment:**_____
Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____
Remarks:_____
_____
_____

Certified Temperature	**Thermometer Reading**	**Correction**
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Tolerance: General purpose thermometers must maintain an accuracy of ± 1E F unless otherwise stated.

GENERAL PROCEDURE

1. Bring the water bath to a constant temperature of 85 F.
2. Place thermometer in the bath.
   A. For total immersion, ensure that total immersion types are on a rack at a minimum clearance of 1" between the bottom of the rack and thermometers.
   B. For partial immersion, the depth of the partial immersion must be within 1 mm of the immersion line on the thermometer.
3. Allow a minimum of 5 minutes for thermometer to stabilize.
4. Establish the water bath temperature.
5. Remove one thermometer at a time and read to the nearest 1 F.
6. Etch the date inspected on all thermometers that fall within the ± 1 F tolerance.
7. Return all thermometers which are not in compliance to the supplier for replacements.

Reference: National Institute of Standards and Technology Test No. G33783. This thermometer has been tested by comparison with standards certified by NIST. If the correction is + the true temperature is higher than the reading. If the correction is - the true temperature is lower that the thermometer reading. All temperatures are based on IPTS-68. If the ice point is included, subsequent change in its reading will change all other readings by the same amount.

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Timers (cp-ti) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 6 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment:_____ **Calibration Procedure:** UDOT cp-ti
Calibration Equipment Used: Atomic Clock- Boulder Colorado
Action Recommended: Repair_____ Replace_____ None_____ Other _____
Remarks:_____

SITE	SPECIFIED	MEASURED
A. Graduation intervals	0.1 second	_____
B. % accuracy	Accurate to within 0.05% when tested over intervals of not less than 15 minute	_____

Comments:_____ _____
_____ _____
_____

GENERAL PROCEDURE (atomic clock accessible)

A. Note requirement and verify
B. Call the Atomic Clock in Boulder, Colorado (303-499-7111). At the tone start timer and note the minute given verbally. Hang up the phone.
C. Let the timer run for at least 15 minutes.
D. Call the Atomic Clock again and stop the timer precisely at the minute tone. Again note the minute given.
E. Record time in minute elapsed between tones and the time elapsed on timer.

% accuracy= (A-B)/B *100
A= reading on lab timer (sec)
B= time between tones (sec)

Comments: _____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Unit Weight Container - Concrete (cp-uwct) **Date of Calibration:** _____

Inspector: _____ **Calibration Interval:** 12 months

Serial Number: H-3661 **Next Calibration Date:** _____

Location of Equipment: Central Materials Lab **Test Procedure:** T-121, C-138

Calibration procedure: UDOT cp-uwct

Calibration Equipment Used: Calibrated thermometer, scale or balance, and clear plastic plate.

_____

Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks: _____

SITE	MEASUREMENTS	
A. Temperature Verification	Temperature setting/time:	Actual reading:
	_____	_____
	_____	_____
	_____	_____

Comments: _____

_____

_____

GENERAL PROCEDURE

1. Bring all water and molds to a constant temperature of 22.7C + 2C.
2. Measure the weight or tare of the unit weight container and the plastic plate.
3. Fill the container with water at 22.7C so that a dome is formed above the opening.
4. Place one edge of the plastic plate on one side of the unit weight container and lay the plate down on the unit weight pushing the air out to one side.
5. Ensure all the air has been evacuated and weigh the assembly. Use the following formula to calculate the volume of the vessel: c-A + Volume in cu ft 62.4
   - A Tare of bucket and plate
   - B Weight of water only
   - C Total weight filled with water

Utah Department of Transportation
Materials Laboratory - Calibration Report

Apparatus: Unit Weight Measures - Aggregate (cp-uwa)

Date of Calibration: _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number:_____ **Next Calibration Date:**_____
Location of Equipment: Aggregate Lab **Test Procedure:** T-19
Calibration procedure: UDOT cp-uwa

Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Temperature of Water and Molds, EC	
Weight of Unit Weight Container and Plastic Plate - a, kg	
Weight of Unit Weight Container, Plastic Plate, and full of water at - c, kg	
Volume of Unit Weight Container, m^3 (c-a)/b b=unit weight of water kg/m^3 for given temperature from Table 3 in Procedure T-19	

Comments:_____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Vacuum Capillary Viscometers
Inspector:_____
Serial Number:_____
Location of Equipment: Asphalt Laboratory

Date of Calibration: _____
Calibration Interval:_____
Next Calibration Date:_____
Test Procedure: T202.X4
Use Calibration Form :UDOT cp-vb

Calibration Equipment Used: Viscosity Standards
Calibrated Stopwatch
Calibrated Thermometer

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

	Timing Marks	**Trial 1**	**Trial 2**
A. Time (t) between timing marks.	_____	_____	
	_____	_____	_____
	_____	_____	

B. Viscosity of viscosity Standard at calibration Temperature (v) STANDARD _____

	Bulb	**Trial 1** K	**Trial 2** K	**Average** K
C. Calculate viscometer bulb calibration factor (K)	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____

Note: the duplicate determinations of calibration constant, K, for each bulb must agree within 2 per cent of their mean. Use the formula: $K = v/t$

General Procedure: see AASHTO T 202, X4.3 through X4.3.1.8

Comments: _____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: **Vacuum System (cp-vac)** **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 12 months
Serial Number: St#44-1122 **Next Calibration Date:**_____
Manufacturer: Welch-Duo-Seal **Model:** 14502 L-05
Location of Equipment:_____ **Test Procedure:** In house procedure/T209
Calibration procedure: UDOT cp-vac

Calibration Equipment Used: Vacuum gauge capable of 30 Hg

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Reading in psig: _____

Reading in Hg: _____

Procedure:

1. Turn on the gauge 15 minutes before beginning the test.

2. Connect the gauge to the system with the trap in line between the system and the gauge, making sure all connections are air tight.

3. Open the number of lines normally used in testing.

4. Allow the readout of the gauge to stabilize.

5. Read and record the pressure indicated on the gauge.

Comments:_____

_____

_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Viscometer Bath (cp-vb, cp-kvis)
Inspector:_____
Serial Number:_____
Manufacturer:_____
Location of Equipment: Asphalt Lab

Date of Calibration: _____
Calibration Interval: 6 months
Next Calibration Date:_____
Model:_____
Test Procedure: ASHTO T-245
Calibration procedures: UDOT cp-vb, UDOT cp-kvis

Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Time	Temperature
_____	_____
_____	_____
_____	_____
_____	_____

Bath temperature maintained to within ±0.06E C of test temperature for operating purposes.

Yes _____ No _____

Comments:_____

_____

Procedure:
1. Turn on the viscometer bath and allow it to come to test temperature. Leave on for a minimum of four hours.
2. Record temperatures at half hour intervals.

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Water Bath (cp-wb)
Inspector:_____
Serial Number:_____
Manufacturer: VWR Scientific
Location of Equipment: Bituminous Lab

Date of Calibration: _____
Calibration Interval: 6 months
Next Calibration Date:_____
Model: 1245-PC
Test Procedure: ASHTO T-245
Calibration procedure: UDOT cp-wb

Calibration Equipment Used: Calibrated ASTM 47F or 47C thermometer Serial # 1137

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

Time	Temperature

Procedure:

1. Turn on the water bath and allow it to come to test temperature. Leave on for a minimum of four hours.

2. Record temperatures at half hour intervals.

Comments:_____ _____
_____ _____
_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Water Bath - Penetrometer (cp-wb) **Date of Calibration:** _____
Inspector:_____ **Calibration Interval:** 6 months
Serial Number:_____ **Next Calibration Date:**_____
Manufacturer:_____ **Model:**_____
Location of Equipment: Asphalt Lab **Test Procedure:** ASHTO T-49
Calibration procedure: UDOT cp-wb

Calibration Equipment Used:_____
Action Recommended: Repair_____ Replace_____ None_____ Other _____
Remarks:_____

_____

Time	Temperature
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Procedure:

Bath temperature maintained to within ± 0.1EC. Of the test temperature for operating purposes

YES _____ NO _____

Comments:_____
_____
_____

Utah Department of Transportation

Materials Laboratory - Calibration Report

Apparatus: Weighing Devices - Materials Tests (cp-wd)

Date of Calibration: _____ **Calibration Interval:**_____
Inspector:_____ **Next Calibration Date:**_____
Serial Number:_____ **Model:**_____
Manufacturer:_____ **Test Procedure:** ASHTO M 231-90
Location of Equipment:_____ **Calibration procedure:** UDOT cp-wd

Calibration Equipment Used:_____

Action Recommended: Repair_____ Replace_____ None_____ Other _____

Remarks:_____

_____

Scale And Balance Worksheet

Scale Capacity:_____ Acceptance Tolerance:_____

Value of Scale Division:_____ Maintenance Tolerance:_____

	Measured		Zero Load	
Increasing - Load Test:	**Load**	**Value**	**Tolerance**	**Balance**
1/4 Capacity	_____	_____	_____	_____
½ Capacity	_____	_____	_____	_____
Shift Test	_____	_____	_____	_____
3/4 Capacity	_____	_____	_____	_____
Full Capacity	_____	_____	_____	_____
Decreasing - Load Test	_____	_____	_____	_____
Zero - Load Balance	_____	_____	_____	_____

Within Tolerance:_____ **Out of Tolerance**:_____

Comments: _____

_____